MINERAL LAND CLASSIFICATION OF VENTURA COUNTY

PART I

DESCRIPTION OF THE MINERAL LAND CLASSIFICATION PROJECT OF VENTURA COUNTY

PART II

CLASSIFICATION OF SAND, GRAVEL, AND CRUSHED ROCK RESOURCE AREAS, SIMI PRODUCTION-CONSUMPTION REGION

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CLASSIFICATION OF SAND, GRAVEL, AND CRUSHED ROCK RESOURCE AREAS, WESTERN VENTURA COUNTY PRODUCTION-CONSUMPTION REGION

1981

ALIFORNIA DIVISION OF MINES AND GEOLOGY

PECIAL REPORT 145

ARTS I, II and III

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SPECIAL REPORT 145

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CLASSIFICATION OF SAND, GRAVEL, AND CRUSHED ROCK RESOURCE AREAS, WESTERN VENTURA COUNTY PRODUCTION-CONSUMPTION REGION

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1981

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PREFACE

The principal objective of this report is to describe and exploin the Colifornio Division of Mines and Geology's clossification of the Venturo area into Mineral Resource Zones, bosed on guidelines odopted by the Californio Stote Mining ond Geology Boord and under outhority granted by the Surface Mining and Reclamation Act of 1975 (SMARA). Another objective is to ossist the Stote Mining ond Geology Board in designating lands that ore most needed for their minerol content. The designotion process is designed to ossist and guide local leod ogencies responsible for lond-use planning and management.

The Ventura oreo, which includes the southern part of Ventura County ond ports of southwestern Los Angeles County, has a population of neorly half a million people ond is one of the most ropidly urbanizing areas in Colifornia.

As with any metropolitan or rural region undergoing urban development, it is important thot the Ventura area hos adequate supplies of readily ovoiloble mineral commodities. Minerals used in construction, particulorly sond, grovel, or stone used in concrete, must be available in lorge quantities and at reasonable costs. However, it often hoppens that, as more ond more lond in a region becomes urbanized, nearby available sand and grovel deposits suitable as sources of aggregote tend to be either depleted by mining or lost to competing land uses. As this happens, more ond more distant sources must be used to supply the region's needs for aggregate. Increases in haulage distance bring increases in the cost of oggregate to consumers ond olso undesiroble impacts on the environment. However, appropriate lead agency policies and procedures con extend the life of the locol supply of aggregate significantly.

This report consists of three parts covering two production-consumpton regions that have been identified in the Ventura area. Part I is on introductory section describing the bockground, purpose, and scope of the overall project. Port II presents the clossificotion of oggregote resource oreos in the Simi Production-Consumption Region. Part III presents the clossificotion of aggregote resource oreos in the Western Ventura County Production-Consumption Region. Information in Parts II ond III include maps showing the locations of significant sand and grovel deposits of the two production-consumption regions as well as tables, charts, ond discussions that present doto on population, production, oggregate consumption, future requirements, ond estimotes of aggregate resources.

Some of the resource volume numbers for the Western Ventura County P-C Region have hod minor revisions since the preliminary draft of this report was releosed. This finol version of the report shows the correct figures. None of these changes were substantiol in size ond they hove not oltered bosic conclusions reoched regarding aggregate resources in the County.

The reader may also wish to refer to the Colifornio Division of Mines and Geology Speciol Report 139, "Aggregates in the Greater Los Angeles Areo" (Evons ond others, 1979). Speciol Report 139 describes and evaluates the significance, use, prices, marketing, transportation, supply, and other factors that relate to the aggregate industry of the greater Los Angeles metropolitan area, including southern Venturo County. Speciol Report 143 (Anderson and others, 1979), the first Minerol Lands Classification Study done under the Surface Mining ond Reclomotion Act, served os o model for the following report.

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EXECUTIVE SUMMARY

The California Division of Mines and Geology (CDMG) has classified land in Ventura County south of the Los Padres National Forest Lands according to the presence or absence of construction aggregate resources. Special attention has been given to aggregate suitable for use in Portland cement concrete, the highest quality use of sand, gravel, and crushed rock. The classification was completed in accordance with guidelines established by the State Mining and Geology Board in compliance with the Surface Mining and Reclamation Act of 1975.

Southern Ventura County was divided into two separate regions on the basis of existing aggregate production and consumption patterns. Each region is discussed as a separate part of this report: the Simi Production-Consumption Region as Part II and the Western Ventura County Production-Consumption Region as Part III (see Figure 1.4 on page 6). These parts present results of the mineral land classification, aggregate resource tonnage estimates, and projected aggregate needs over the next 50 years for their respective areas.

Aggregate resource tonnage estimates for individual sand and gravel deposits were calculated mainly on the basis of limited field observations, analyses of water-well records, and a broad understanding of the geology of the locality in question. Exploratory drilling and rock-quality laboratory testing to generate independent, detailed data could not be done. It should be recognized, therefore, that the figures for resource tonnage, although based on sound geologic reasoning, are *estimates* and, as such, have an inherent degree of uncertainty.

Also, it must be noted that large aggregate resource tonnage figures are presented in the text of this report. These figures represent the total aggregate resource estimated to underly a particular area, sometimes to relatively great depths. The estimates represent the total quantity of aggregate material that is geologically available for mining, but they do not reflect such constraints as current land use (except urban areas) or political, sociological, environmental, economical, and technological factors. Given the above-mentioned constraints, it is unlikely, as a practical matter, that much of the large resource tonnage estimates will ever be translated into processed aggregate. However, the material that might be regarded as unminable because of the above constraints remains available and could meet future needs, were they ever to become great enough to warrant extraction of the material.

Figures for total aggregate needs over the next 50 years were projected on the basis of past per capita consumption rates and projected population increases. As guideline figures for future aggregate needs, these estimates are valid. It is, of course, always possible that unforeseen events—for example, a massive urban-renewal effort or reconstruction after a major disaster—will significantly change the amount of aggregate needed to fulfill future needs.

The Simi Production-Consumption (P-C) Region has a population of over 300,000, which is projected to increase to over 600,000 within the next 50 years. The average annual per capita rate of aggregate consumption within this region is estimated to be 5.5 tons. Western Ventura County, the westernmost of the two P-C regions, has a population of over 350,000, which is expected to increase to over 700,000 within the next 50 years. The average annual per capita rate of aggregate consumption within this region is estimated to be 11.0 tons.

In the Simi P-C Region, aggregate is produced from the Simi Conglomerate and Saugus-San Pedro Formations by six operating companies at six operating sites. In the Western Ventura County P-C Region, aggregate is extracted from the Santa Clara and Ventura River systems by three companies at six operating sites.

Major conclusions regarding aggregate availability for the Simi P-C Region are summarized below:

1) Over the next 50 years, the region will need over 130 million tons of aggregate to meet its requirements, 40 million tons of which must be coarse material (particles larger than 4 mm in size).

2) Estimates derived from the present study indicate that there are approximately 170 million tons of reserves available, 50 million tons of which represent coarse material suitable for use in Portland cement concrete. Aggregate reserves and resources are present within the Simi Conglomerate and the Saugus-San Pedro Formations. Current mining operations are producing both fine and coarse aggregate from each geologic unit, but in time operations in the Simi Conglomerate will run out of fine material and it will have to be transported from sources in the Saugus-San Pedro Formations. Likewise, operations in the Saugus-San Pedro Formations

in time will run out af coorse moterial and it will have to be tronsparted from sources in the Simi Canglamerote. The amaunt af transpartotian that will then be required will significontly increase the price af Portland cement concrete and have a severe impoct an the enviranment af the regian. Nevertheless, far the Simi P-C Region to continue to meet its Partland cement cancrete needs fram lacal saurces thraugh the next 50 years, its Partland cement concrete will have to be praduced fram a mix af moteriols from bath the Simi Canglamerate and the Saugus-Son Pedro Formotions.

3) It is estimoted that there are aver o billion tons af resources avoilable. Of this, aver 550 million tons represent coorse moteriol thot is suitable far use in Partland cement concrete.

4) The current reserves ore odequote ta caver the projected 50-year needs pravided depletian is not accelerated by on increose in locol consumptian rate, draw-dawn by adjocent P-C regians, ar a lass af reserves as a result af some use of the lond thot would preclude extractian.

5) As a practical matter, much, if nat mast, af the resources identified in the current study may never translate inta reserves far ecanamic, technological, environmental, ar politicol reosons.

6) Provisians shauld be made ta designate Sectar A and substantial partians af Sectars B ond C os hoving regianol significonce os sources of aggregate suitable far Partland cement cancrete so that these areos will be available far the 50-year requirements for the regian. Aggregote reserves ond resaurces must came fram sectars A, B, and C in arder ta ensure that the proper size distributian is available far Partland cement concrete aggregate (see item 2 obave).

Majar conclusians regarding aggregate availobility for the Western Venturo County P-C Region are summarized belaw:

1) Over the next 50 yeors, the regian will need opproximotely 310 million tons of oggregote to meet its requirements. Of this, 190 millian tans must be material suitable far Partland cement cancrete aggregate.

2) The present study estimates thot there ore oppraximotely 40 millian tons of oggregate reserves suitable far Partland cement cancrete, asphaltic cancrete, and raad base (30 millian tans far Partland cement cancrete anly). Current reserves are adequate far 13 yeors.

3) Resources suitable far use in Partland cement cancrete within the Western Ventura Caunty P-C Regian are estimated ta be 4 billian tans. Of these, 265 million tons occur within campany-held lands below allawed mining depths. The remoinder of these accur elsewhere within the Santa Cloro River system.

4) The inhobitants of the Western Ventura Caunty P-C Regian have anly three aptians by which they can meet the shartfall af 160 millian tons af aggregate suitoble for use in Portlond cement cancrete ta satisfy their 50-yeor requirement. These aptions are: (1) permit mining ta greater depths within the current mining areos ond/ar extend the loterol size of the existing pits; (2) mave mining operotions to same new locotions within the river systems where resaurces are knawn ta exist; (3) acquire resaurces fram autside the regian. All three aptians present problems that must be evaluated. These include enviranmentol, safety, ond ecanamic prablems.

5) As a practicol matter, much, if nat most, of the resources identified in the Western Ventura County P-C Regian may never become reserves for ecanamic, technical, enviranmentol, or paliticol reasans.

6) It is recammended that the State Mining ond Geology Boord cansider designating areas cantained in Sectars A-J os lands cantaining sand and grovel of regianol significonce.

GLOSSARY OF GEOLOGICAL TERMS
(adapted from American Geological Institute and from USGS Bulletin 1450- A)

- *aggregate:* Any of several hard, inert, canstruction materials (such as sand, gravel, shells, slag, crushed stone, or other mineral material), or combinations thereof,used far mixing in specified size distributions with a cementing or bituminous material to form such products as concrete, asphaltic concrete, mortar, and plaster.

- *aggregate reserves:* Aggregate materials concluded to be acceptable far commercial use that exist within praperty boundaries owned or leased by an aggregate producing company and far which permissian allowing extractian and processing has been granted by the proper land-use regulation authorities.

- *aggregate resaurces:* Resources include reserves as well os all similar potentiolly usable oggregate materials that may be mined in the future, but for which na use permit allowing extractian has been granted, ar far which develapment has not been definitely established ta be feasible based upon current technolagical ar ecanomic conditions.

- *alluvial fan:* A law, autspread, relatively flat ta gently sloping depasit af sand and gravel, and shaped in aerial view like an open fan ar a segment af a cane, normally depositesd by a stream with its apex at the place where the stream issues fram a narraw mountain valley upon a plain ar broad valley.

- *alluvial terrace:* A stream terrace campased af uncansalidated alluvium (inlcuding gravel), produced by renewed downcutting af the fload plain by a rejuvenated stream.

- *alluviatian:* The pracess af deposition or formation af alluvium or alluvial features at places where stream velacity is decreased ar streamflaw is checked.

- *alluvium:* A general term far clay, silt, sand, gravel or similar unconsolidated detrital material depasited during camparatively recent gealogic time by a stream ar ather body af running water as a sarted ar semisarted sediment.

- *asphaltic concrete:* Mixed asphalt (binder) and crushed stone, gravel, and sand used far paving and roofing.

- *base level:* The lawest level toward which erosion of a region of the Earth's surface constantly pragresses but seldam, if ever, reaches; especially the level belaw which a stream cannat erode its bed. The general, ar ultimate base level for the land surface is sea level, but temporary base levels may exist regianally.

- *base material:* Specified material (caarse gravel, crushed stane) used in the canstructian af the base caurse, a battam layer designed far ane ar mare functions such as distributing load, praviding drainage, and minimizing frast actian.

- *basement rack:* An assemblage of undifferentiated rocks that underlies the younger, sedimentary depasits in the area. The basement racks are igneaus and metamarphic in arigin.

- *basin:* A depressed area in which sediments accumulate.

- *bedrock:* A general term for the rock, usually solid, that underlies sail ar ather uncansalidated material.

- *Cenozaic:* An era af gealagic time, fram the end of the Mesozoic ta present. Considered to have begun obout 70 million years ago.

- *coalescing alluvial fans:* A series of alluvial fans farming a braad, cantinuaus, gently inclined surface extending along and fram the base af a mauntain range out into and around an inland basin.

- *consalidation:* Any pracess whereby loosely arranged, soft, ar liquid earth materials become firm and caherent rack.

- *construction materials:* Natural and manufactured industrial mineral and rock materials used by the construction industry. These materials include: aggregate (crushed stane, sand and gravel, lightweight aggregate, and slag), cement and cement raw materials, dimension and cut stone, granules, gypsum and anhydrite, and insulating materials.

- *crystalline rock:* An igneous or metomorphic rock consisting wholly of interlocking crystals. Igneous rocks develop through cooling from a molten stote. Metomorphic rocks have undergone recrystallizotion os o result of temperature and pressure changes.

- *deposit:* Moteriol of any type or from any source thot has accumulated by some noturol process or agent, either in the form of consolidoted or unconsolidoted material.

- *detrital:* Pertoining to or formed from detritus, which is loose rock and moteriol (grovel, sond, silt, ond clay) thot is worn off or removed from older rocks ond moved from its place of origin.

- *deuteric:* A water-associated alterotion process that occurs during the late stages of crystollization of on igenous rock. Certain minerals composing the rock may react or be transformed into different minerals.

- *distal:* Formed farthest from the source oreo.

- *gabbro:* A dense, dork crystolline igenous rock - the intrusive equivalent of bosolt.

- *granitic gneiss:* A metomorphic rock thot hos o minerol composition similor to granite.

- *"hardpan":* A term used loosely to designote any relotively hard layer that is difficult to excavate or drill.

- *indurated:* Term applied to a deposit that has been hardened by the oction of pressure, cementation, and heat.

- *intrusion:* The process of emplocement of molten rock in pre-existing rock.

- *lens:* A geologic deposit bounded by converging surfoces (at least one of which is curved), thick in the middle ond thinning out toward the edges, resembling a convex lens.

- *market area:* The area in which a commodity is sold and used. For bulky low-unit-price moterials like oggregote, the market area is usually a specific geogrophic region of the state. This is a production-consumption region in the CDMG classification of sond ond grovel.

- *massive unit:* Sedimentary rock that occurs in very thick, homogeneous beds; sedimentary rock that is obscurely bedded or seems to be without internal structure.

- *Mesozoic:* An era of time, from the end of the Poleozoic to the beginning of the Cenozoic (about 280 million yeors ago to 70 million yeors ogo).

- *Paleozoic:* An era of geologic time, from the end of the Precambrian to the beginning of the Mesozoic (about 600 million yeors ogo to 280 million yeors ogo).

- *petrographic analysis:* Description and systematic classificotion of rocks by means of microscopic examinotion of thin sections of rocks.

- *Precambrian:* All geologic time before the beginning of the Paleozoic.

- *Quaternary:* The second period of the Cenozoic ero (following the Tertiary), thought to cover last two or three million yeors.

- *rejuventated:* A stream stimlulated to renewed erosive activity, os by uplift or by a drop of sea level; stream thot hos reverted to the activities and forms of o more youthful stoge.

- *source area:* The area from which the constitutent moteriols of o sedimentory rock are derived.

- *tectonism:* General term for all movement of the crust produced by eorth forces, including the formotion of ocean basins, continents, ploteous, and material ranges.

- *terrace:* A relatively level or gently inclined surface, generally less broad than a plain, that commonly occurs olong the morgin and obove the level of o body of water, morking o former woter level.

- *terrane:* Term applied to a rock or group of rocks and to the oreo in which it outcrops.

- *Tertiary:* The first period of the Cenozoic era, thought to hove covered the time span between 65 ond three to two million yeors ogo.

- *wash:* A braad, shallow, gravelly, or stany, narmally dry bed af an intermittent stream.

- *waste factor:* A numerical factar used ta calculate the amaunt af a mineral depasit that does nat meet industrial specificatians and therefare is not af ecanamic value. It is given as a percent and largely reflects the amaunt af silt ar clay in a sand and gravel depasit.

- *youthful:* First stage in the develapment of a steam, characterized by active and rapid dawncutting, forming a deep, narraw, steep-walled, V-shaped valley with a steep and irregular gradient.

- *zeolite:* A large graup af white ar calarless minerals that commanly accur as secandary minerals filling cavities and caating cracks in basaltic lavas and other rocks.

- *zeolitization:* Intraductian af, ar replacement by, a mineral (ar minerals) af the zealite graup.

PART I

DESCRIPTION OF THE MINERAL LAND CLASSIFICATION PROJECT OF VENTURA AREA

BACKGROUND AND PURPOSE

To establish an effective and comprehensive surface mining and reclamation policy, the California Legislature enacted the Surface Mining and Reclamation Act (SMARA) of 1975 (see Appendix A-1). SMARA requires the State Geologist to classify, according to the presence or absence of significant mineral deposits, certain areas of the State subject to urban expansion or other irreversible land uses incompatible with mining. Urbanizing areas in this context are those identified by the State Office of Planning and Research (OPR) or by the State Mining and Geology Board.

The Board, upon receipt of the classification information from the State Geologist, transmits the information to the appropriate lead agencies and other interested parties. Following compliance with California Environmental Quality Administration (CEQA) requirements and after public hearings, the Board may designate identified mineral deposits in classified areas as being of statewide or regional significance. The objective of the classification and designation processes is to ensure, through appropriate lead agency policies and procedures, that mineral deposits of statewide or of regional significance are available when needed.

On January 13, 1978, the State Mining and Geology Board adopted Resolution No. 22, "Priorities for Mineral Lands Classification" (revised November 2, 1978), which scheduled the general order of the work for the State Geologist to classify different areas within the State (Appendix A-2). The priorities for classification were determined by the Board pursuant to a mandate in SMARA. The criterion used by the Board in establishing priorities is the general perception of the urgency of need for mineral resource information and planning assistance by the various lead agencies. Aggregate resources were deemed to be of more immediate concern than other mineral commodities; therefore, the Board reflected this also in setting the priorities.

The "Guidelines for Classification and Designation of Mineral Lands" were adopted by the State Mining and Geology Board on June 30, 1978 (Appendix A-3). The purpose of these guidelines is to provide direction to the State Geologist in carrying out the classification of mineral land, and to establish procedures for the designation process. Section I.1a of the "Guidelines" directs the State Geologist to classify specified areas into *Mineral Resource Zones* (MRZ's) or *Scientific Resource Zones* (SZ's) as defined in Section I.2 of the "Guidelines" (Appendix A-3). In addition, Section I.3 of the "Guidelines" directs that mineral land classification reports identifying areas classified as containing significant deposits of construction material (sand, gravel, and crushed stone) include information about (1) the location and estimated total quantity of construction material that is geologically available for mining, (2) the limits of the market (consumption) region which the potentially producible commodity would serve, and (3) an estimate of the total quantity of material that will be needed to supply the requirements of the county and consumption region for the next 50 years. This information assists the State Mining and Geology Board in determining the regional or statewide significance of these types of deposits for purposes of designation.

The Aggregate (Sand and Gravel and Crushed Rock) Mineral Land Classification of Ventura Area was initiated in August 1979 by the State Geologist. The Ventura area was assigned a high priority for classification in response to a request by land planners of Ventura County and in recognition that the Ventura area is undergoing rapid urbanization. The project area includes the southern part of Ventura County and parts of southwestern Los Angeles County (Figure 1.1).

The emphasis in the Ventura County classification is placed on Portland cement concrete aggregate. The material specifications for this commodity are more restrictive than for other aggregate types, so fewer sand and gravel deposits satisfy them. Those deposits that are acceptable for use as PCC aggregate are thus the scarcest aggregate resources in the county and are of the most concern in terms of planning future availability of this commodity.

Classification for other mineral resources will be done following the initial statewide classification of urbanizing areas for aggregate resources.

In keeping with the goal of determining the regional significance of a particular mineral deposit, each major sand and gravel deposit or bedrock deposit in the Ventura area has been evaluated separately. The project area was divided into two production-consumption (P-C) regions on the basis of existing Portland cement concrete aggregate production and consumption patterns. In determining these patterns and, subsequently, in evaluating the significance of deposits within each P-C region, alternative sources, including the possible available resources of adjacent P-C regions, were considered.

REFINING PROJECT BOUNDARIES

Maps supplied by the State Office of Planning and Research (OPR) served to identify urbanized and urbanizing areas within the Ventura area (Figure 1.2). These maps are part of a series of eight issued by the Office of Planning and Research in July 1975 as the "Urban Expansion Map of California." The maps were published at a scale of 1:500,000 (1 inch approximately equal to 8 miles), and show "Existing Urban - 1970" and "Projected Urban - 1990" areas.

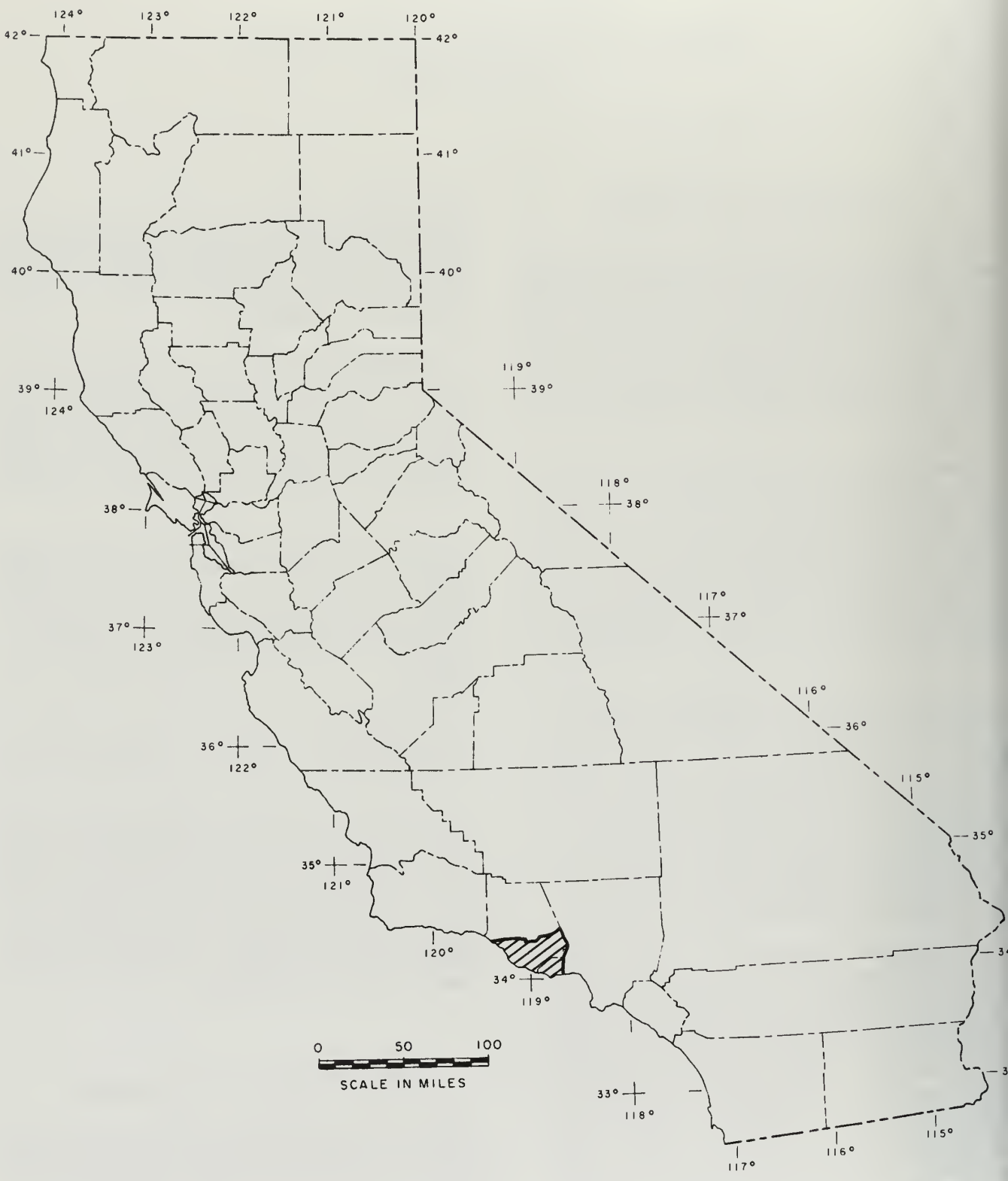


Figure 1.1 Project boundaries: Mineral Land Classification of Ventura County.

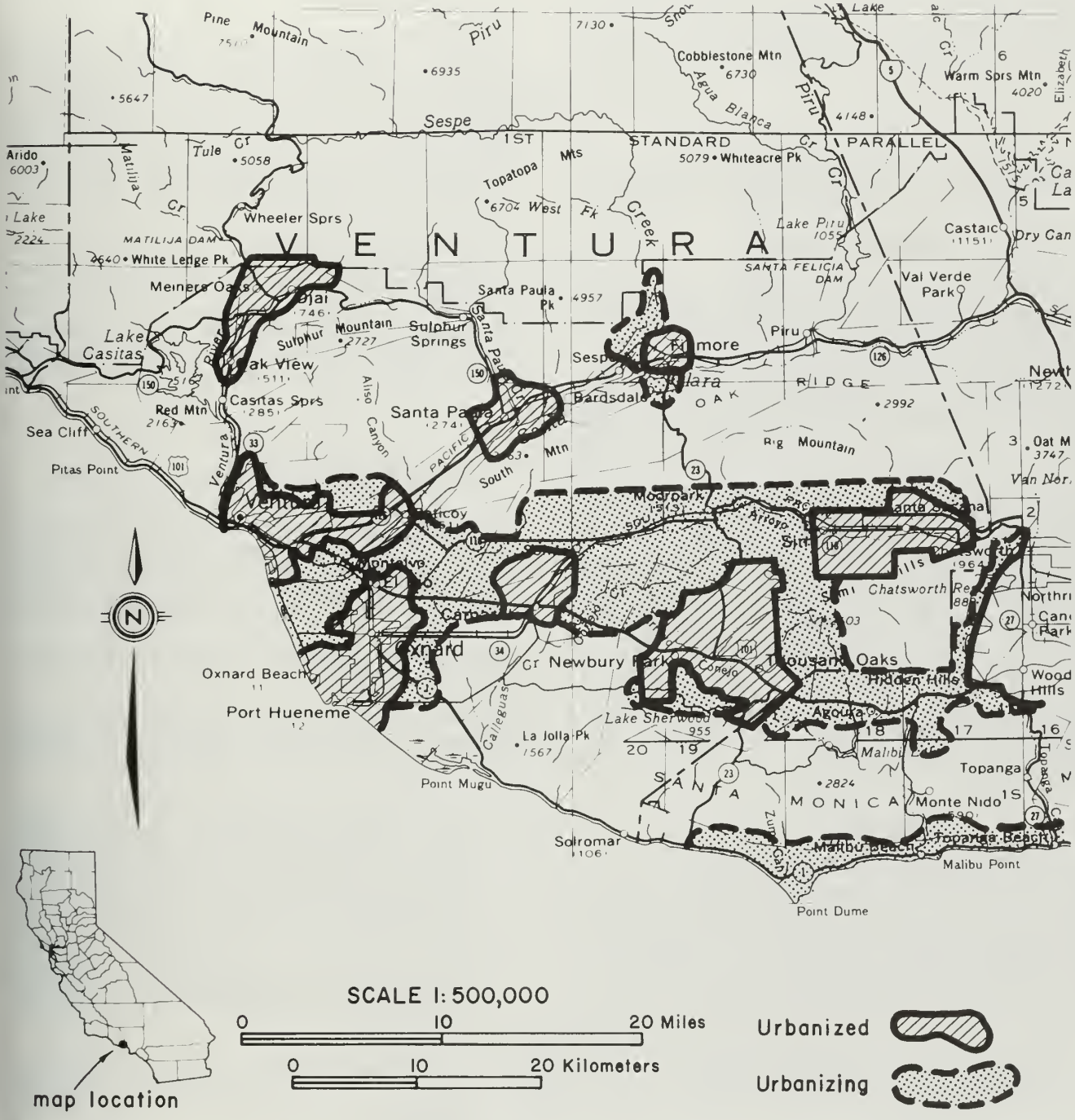


Figure 1.2 Urbanized and urbanizing areas of Ventura County as identified by the Office of Planning and Research, July 1975.

The "existing urban" areas shown on the OPR maps are the basis for the *unmodified urbanized* areas used for the land classification maps developed during the present study; similarly, the "projected urban" areas are the *unmodified* OPR *urbanizing* areas. Because the OPR maps were produced several years ago, those boundaries were modified at the Board's request to reflect current conditions. This was accomplished by obtaining information from local lead agencies (usually planning departments), by interpreting recent aerial photographs, and by on-site examination to determine where urbanization is occurring and anticipated to occur ("urbanized") in the next 10 to 30 years.

DETERMINATION OF PRODUCTION-CONSUMPTION REGIONS

Marketing Regions

To evaluate the significance of a mineral commodity, it is necessary to know where the commodity is produced and where it is consumed. Some mineral commodities, such as the borate deposits of Death Valley, have a worldwide market area and, therefore, have worldwide significance. However, low-value bulk commodities such as sand and gravel are marketed regionally, and their significance should therefore be measured on a regional level.

Large metropolitan areas usually obtain sand and gravel or crushed stone for construction purposes from several sources within their region. The Ventura area meets its aggregate needs from 12 aggregate plants clustered in two major aggregate production districts (Figure 1.3). The plants operate within the jurisdictional boundaries of 11 lead agencies (nine city governments and two county governments) (Table 1.1). Producers within a major production district generally share a common market region. Because each of the two major production districts in the Ventura area has its own characteristic marketing areas, it was possible to divide the Ventura area into two separate aggregate "Production-Consumption" (P-C) regions: the Simi Production-Consumption Region and the Western Ventura County Production-Consumption Region.

Transportation Rates

The boundaries for these P-C regions were based upon a comparative analysis of the haulage costs for the different production districts in the area. These costs generally follow minimum transportation rates that are reported and periodically updated by the California Public Utilities Commission (PUC, 1972), which fixes minimum transportation rates for the delivery of aggregate products by independent trucking firms in southern California. Although the PUC minimum rates do not apply to aggregate producers who transport their own product, the producers use the PUC minimum rates as guidelines for haulage rates. The schedule of rates contained in MRT 17A is based on both the mileage and time involved for delivery. MRT 17A is accompanied by a series of maps that divide the Ventura area into numerous rock product delivery zones keyed to the MRT listing by code number.

The minimum transportation rates set by MRT 17A and the appropriate "Rock Products Delivery Zones" maps were used in the present study to aid in the determination of preliminary P-C region boundaries. First, the minimum transportation rates for all production localities were plotted on the delivery zones maps. Next, preliminary P-C region boundaries were drawn along the rock product delivery zones according to the production district which could deliver aggregate at the least fixed minimum rate.

The resulting P-C region boundaries (see Figure 1.4), though by necessity generalized, are reasonably accurate delineations of the respective marketing areas for the two major production districts in the Ventura area. An index map showing P-C region boundary lines in relation to the 7 1/2-minute U.S. Geological Survey quadrangle maps covered in this project area is presented in Figure 1.5. A list of quadrangles is presented in Table 1.2.

MINERAL RESOURCE ZONE CATEGORIES

Mineral Resource Zones (MRZ-1, MRZ-2, MRZ-3, MRZ-4) and Scientific Zones (SZ) that appear on quadrangles that accompany each P-C region report are determined on the basis of guidelines set forth in SMARA and in the "Guidelines for Classification and Designation of Mineral Lands" (Appendix A-3).

The guidelines for establishing the Mineral Resource Zones are also set forth below:

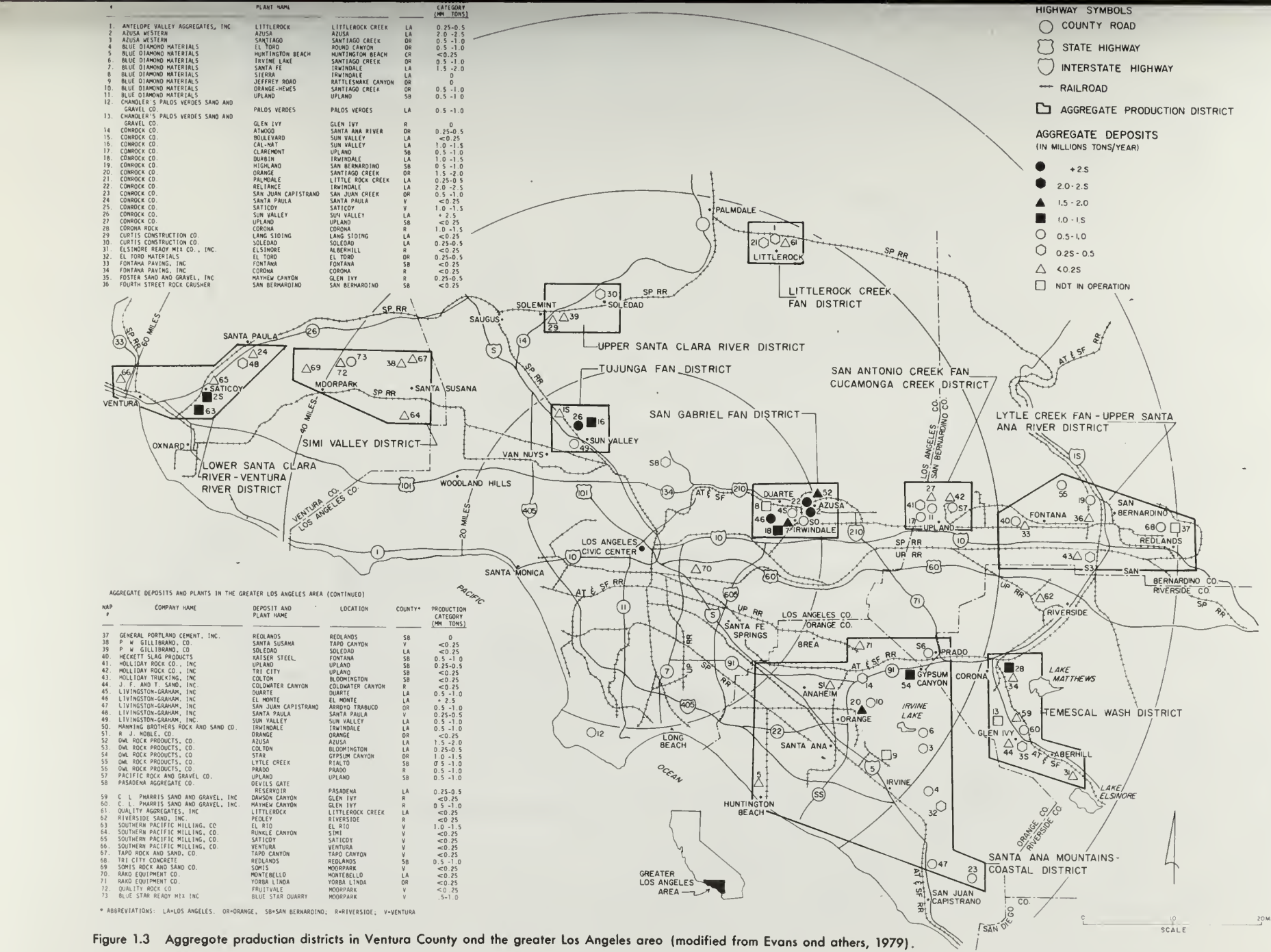
The State Geologist shall classify, on the basis solely of geologic factors, and without regard to existing land use and land ownership, certain areas as one of the following:

(a) MRZ-1 Areas where adequate information indicates that no significant mineral deposits are present, or where it is judged that little likelihood exists for their presence. This zone shall be applied where well-developed lines of reasoning, based upon economic-geologic principles and adequate data, demonstrate that the likelihood for occurrence of significant mineral deposits is nil or slight.

(b) MRZ-2 Areas where adequate information indicates that significant mineral deposits are present or where it is judged that a high likelihood for their presence exists.

Table 1.1 List of lead agencies (county and incorporated city governments) located within or adjacent to the project boundaries of the Mineral Land Classification (Sand and Gravel) of Ventura County. (Cities that have active aggregate operations within their jurisdictional boundaries are denoted by astericks.)

LOS ANGELES COUNTY	VENTURA COUNTY		
Los Angeles	*Santa Paula	Oxnard	Ojai
	Ventura	Carmarillo	Thousand Oaks
	Port Hueneme	Fillmore	Simi Valley



AGGREGATE DEPOSITS AND PLANTS IN THE GREATER LOS ANGELES AREA (CONTINUED)

MAP #	COMPANY NAME	DEPOSIT AND PLANT NAME	LOCATION	COUNTY*	PRODUCTION CATEGORY (MM TONS)
37	GENERAL PORTLAND CEMENT, INC.	REDLANDS	REDLANDS	SB	0
38	P W GILLIBRAND, CO.	SANTA SUSANA	TAPO CANYON	V	<0.25
39	P W GILLIBRAND, CO	SOLEDAD	SOLEDAD	LA	<0.25
40.	HECKETT SLAG PRODUCTS	KAISER STEEL	FONTANA	SB	0.5 -1.0
41.	HOLLIDAY ROCK CO., INC	UPLAND	UPLAND	SB	0.25-0.5
42	HOLLIDAY ROCK CO., INC	TRI CITY	UPLAND	SB	<0.25
43.	HOLLIDAY TRUCKING, INC	COLTON	BLOOMINGTON	SB	<0.25
44.	J. F. AND T. SAND, INC.	COLDWATER CANYON	COLDWATER CANYON	R	<0.25
45.	LIVINGSTON-GRAHAM, INC	DUARTE	DUARTE	LA	0.5 -1.0
46	LIVINGSTON-GRAHAM, INC	EL MONTE	EL MONTE	LA	+ 2.5
47	LIVINGSTON-GRAHAM, INC	SAN JUAN CAPISTRANO	ARROYO TRABUCO	OR	0.5 -1.0
48.	LIVINGSTON-GRAHAM, INC	SANTA PAULA	SANTA PAULA	V	0.25-0.5
49.	LIVINGSTON-GRAHAM, INC.	SUN VALLEY	SUN VALLEY	LA	0.5 -1.0
50.	MANNING BROTHERS ROCK AND SAND CO.	IRWINDALE	IRWINDALE	LA	0.5 -1.0
51.	R J. NOBLE, CO.	ORANGE	ORANGE	OR	<0.25
52	OWL ROCK PRODUCTS, CO.	AZUSA	AZUSA	LA	1.5 -2.0
53.	OWL ROCK PRODUCTS, CO.	COLTON	BLOOMINGTON	LA	0.25-0.5
54	OWL ROCK PRODUCTS, CO	STAR	GYPSUM CANYON	OR	1.0 -1.5
55	OWL ROCK PRODUCTS, CO.	LYTLE CREEK	RIALTO	SB	0.5 -1.0
56	OWL ROCK PRODUCTS, CO.	PRADO	PRADO	R	0.5 -1.0
57	PACIFIC ROCK AND GRAVEL CO.	UPLAND	UPLAND	SB	0.5 -1.0
58	PASADENA AGGREGATE CO.	DEVILS GATE RESERVOIR	PASADENA	LA	0.25-0.5
59	C L PHARRIS SAND AND GRAVEL, INC	DAWSON CANYON	GLEN IVY	R	<0.25
60.	C. L. PHARRIS SAND AND GRAVEL, INC.	MAYHEW CANYON	GLEN IVY	R	0.5 -1.0
61.	QUALITY AGGREGATES, INC	LITTLEROCK	LITTLEROCK CREEK	LA	<0.25
62	RIVERSIDE SAND, INC.	PEOLEY	RIVERSIDE	R	<0.25
63	SOUTHERN PACIFIC MILLING, CO	EL RIO	EL RIO	V	1.0 -1.5
64.	SOUTHERN PACIFIC MILLING, CO.	RUNKLE CANYON	SIMI	V	<0.25
65	SOUTHERN PACIFIC MILLING, CO.	SATICOY	SATICOY	V	<0.25
66.	SOUTHERN PACIFIC MILLING, CO.	VENTURA	VENTURA	V	<0.25
67.	TAPO ROCK AND SAND, CO.	TAPO CANYON	TAPO CANYON	V	<0.25
68.	TRI CITY CONCRETE	REDLANDS	REDLANDS	SB	0.5 -1.0
69	SOMIS ROCK AND SAND CO.	SOMIS	MOORPARK	V	<0.25
70.	RAKO EQUIPMENT CO.	MONTEBELLO	MONTEBELLO	LA	<0.25
71	RAKO EQUIPMENT CO.	YORBA LINDA	YORBA LINDA	OR	<0.25
72.	QUALITY ROCK CO	FRUITVALE	MOORPARK	V	<0.25
73	BLUE STAR READY MIX INC	BLUE STAR QUARRY	MOORPARK	V	.5-1.0

NAP #	COMPANY NAME	PLANT NAME	LOCATION	COUNTY*	CATEGORY (MM TONS)
1.	ANTELOPE VALLEY AGGREGATES, INC	LITTLEROCK	LITTLEROCK CREEK	LA	0.25-0.5
2	AZUSA WESTERN	AZUSA	AZUSA	LA	2.0 -2.5
3	AZUSA WESTERN	SANTIAGO	SANTIAGO CREEK	OR	0.5 -1.0
4	BLUE DIAMOND MATERIALS	EL TORO	ROUND CANYON	OR	0.5 -1.0
5	BLUE DIAMOND MATERIALS	HUNTINGTON BEACH	HUNTINGTON BEACH	CR	<0.25
6.	BLUE DIAMOND MATERIALS	IRVINE LAKE	SANTIAGO CREEK	OR	0.5 -1.0
7.	BLUE DIAMOND MATERIALS	SANTA FE	IRWINDALE	LA	1.5 -2.0
8	BLUE DIAMOND MATERIALS	SIERRA	IRWINDALE	LA	0
9	BLUE DIAMOND MATERIALS	JEFFREY ROAD	RATTLESNAKE CANYON	OR	0
10.	BLUE DIAMOND MATERIALS	ORANGE-HEWES	SANTIAGO CREEK	OR	0.5 -1.0
11	BLUE DIAMOND MATERIALS	UPLAND	UPLAND	SB	0.5 -1.0
12.	CHANDLER'S PALOS VERDES SAND AND GRAVEL CO.	PALOS VERDES	PALOS VERDES	LA	0.5 -1.0
13.	CHANDLER'S PALOS VERDES SAND AND GRAVEL CO.	GLEN IVY	GLEN IVY	R	0
14	CONROCK CO.	ATWOOD	SANTA ANA RIVER	OR	0.25-0.5
15.	CONROCK CO.	BOULEVARD	SUN VALLEY	LA	<0.25
16.	CONROCK CO.	CAL-MAT	SUN VALLEY	LA	1.0 -1.5
17.	CONROCK CO.	CLAREMONT	UPLAND	SB	0.5 -1.0
18.	CONROCK CO.	DURBIN	IRWINDALE	LA	1.0 -1.5
19.	CONROCK CO.	HIGHLAND	SAN BERNARDINO	SB	0.5 -1.0
20.	CONROCK CO.	ORANGE	SANTIAGO CREEK	OR	1.5 -2.0
21.	CONROCK CO.	PALMDALE	LITTLE ROCK CREEK	LA	0.25-0.5
22.	CONROCK CO.	RELIANCE	IRWINDALE	LA	2.0 -2.5
23	CONROCK CO.	SAN JUAN CAPISTRANO	SAN JUAN CREEK	OR	0.5 -1.0
24	CONROCK CO.	SANTA PAULA	SANTA PAULA	V	<0.25
25.	CONROCK CO.	SATICOY	SATICOY	V	1.0 -1.5
26	CONROCK CO.	SUN VALLEY	SUN VALLEY	LA	+ 2.5
27	CONROCK CO.	UPLAND	UPLAND	SB	<0.25
28	CORONA ROCK	CORONA	CORONA	R	1.0 -1.5
29	CURTIS CONSTRUCTION CO.	LANG SIDING	LANG SIDING	LA	<0.25
30.	CURTIS CONSTRUCTION CO.	SOLEDAD	SOLEDAD	LA	0.25-0.5
31.	ELSINORE READY MIX CO., INC.	ELSINORE	ALBERHILL	R	<0.25
32.	EL TORO MATERIALS	EL TORO	EL TORO	OR	0.25-0.5
33	FONTANA PAVING, INC	FONTANA	FONTANA	SB	<0.25
34	FONTANA PAVING, INC	CORONA	CORONA	R	<0.25
35.	FOSTER SAND AND GRAVEL, INC	MAYHEW CANYON	GLEN IVY	R	0.25-0.5
36	FOURTH STREET ROCK CRUSHER	SAN BERNARDINO	SAN BERNARDINO	SB	<0.25

* ABBREVIATIONS: LA=LOS ANGELES, OR=ORANGE, SB=SAN BERNARDINO, R=RIVERSIDE, V=VENTURA

Figure 1.3 Aggregate production districts in Ventura County and the greater Los Angeles area (modified from Evans and others, 1979).

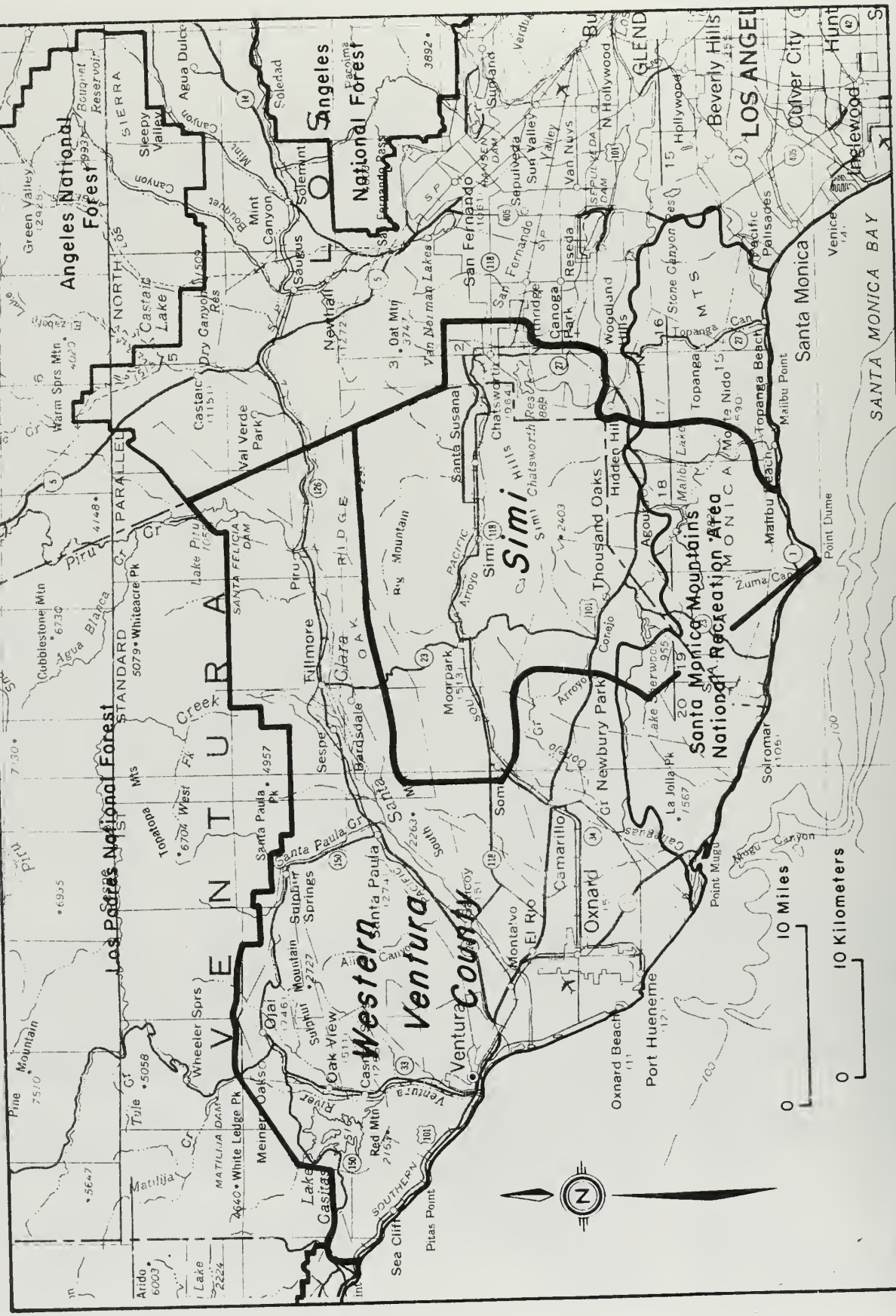


Figure 1.4 Aggregate production-consumption regions of Ventura County.

Table 1.2 List of U.S. Geological Survey 7-1/2 minute quadrangles included in the Mineral Land Classification (Sand and Gravel) of Ventura County. Quadrangles show existing urbanized areas, urbanizing areas, Mineral Resource Zones (MRZ), and well log locations. Quadrangles are indexed on Figure 1.5 by the following number list.

1. Matilija	9. Saticoy	17. Newbury Park
2. Ojai	10. Santa Paula	18. Thousand Oaks
3. Santa Paula Peak	11. Moorpark	19. Calabasas
4. Fillmore	12. Simi	20. Canoga Park
5. Piru	13. Santa Susana	21. Point Mugu
6. Val Verde	14. Oat Mtn.	22. Triunfo Pass
7. Pitas Point	15. Oxnard	23. Point Dume
8. Ventura	16. Camarillo	24. Malibu Beach

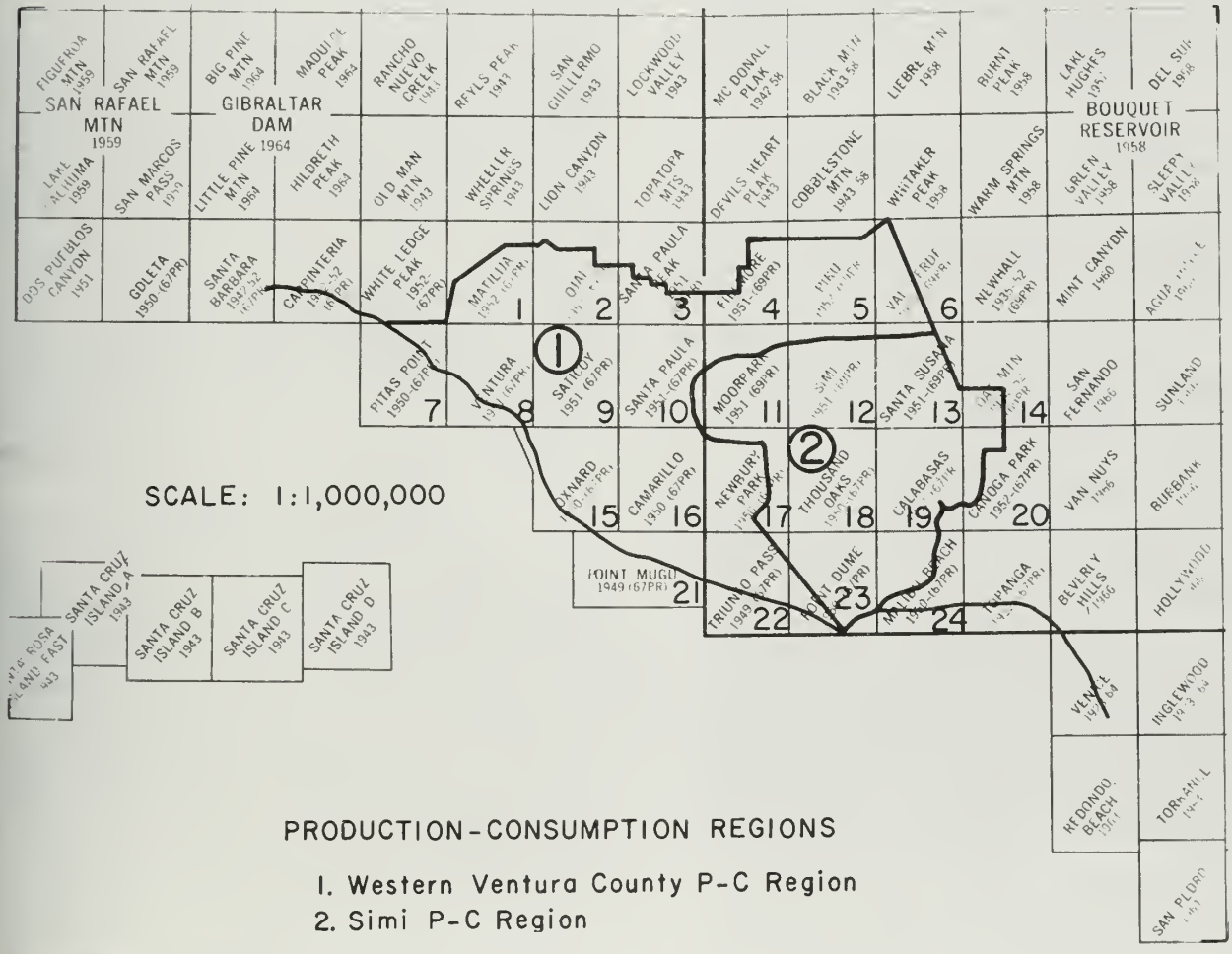


Figure 1.5 Index map af U.S. Gealagical Survey 7-1/2 minute quadrangles showing aggregate praductian-cansumptian regians af the Mineral Land Classificatian (Sand and Gravel) af Ventura Caunty.

This zone shall be applied to known mineral deposits or where well-developed lines of reasoning, based upon economic-geologic principles and adequate data, demonstrate that the likelihood for occurrence of significant mineral deposits is high.

(c) MRZ-3 Areas containing mineral deposits, the significance of which cannot be evaluated from available data.

(d) MRZ-4 Areas where available information is inadequate for assignment to any other MRZ zone.

(e) SZ Areas containing unique or rare occurrence of rocks, minerals, or fossils that are of outstanding scientific significance shall be classified in this zone.

50-YEAR FORECASTS

Basis of 50-Year Forecasts

An estimate of the total quantity of sand and gravel required to supply the needs of each P-C region for the next 50 years will be presented in this report in accordance with the requirements set forth in the "Guidelines for Classification and Designation of Mineral Lands" (Appendix A-3, Section I.3.c.2).

Fifty-year forecasts of aggregate needs are made on the basis of aggregate that was consumed during the years 1960-1978. For the purposes of these calculations, it is assumed that all aggregate produced in a particular P-C region was also consumed within the same P-C region.

Aggregate Consumption Indicators

Factors such as the number of new residential and non-residential building permits issued, miles of new highway constructed, number of non-agricultural employees, and population data were compared with aggregate production records to determine whether or not they bore a direct relationship to the aggregate consumed in a P-C region. Simple linear regression analyses showed that population is the only factor that correlates closely with the amount of aggregate consumed in a given P-C region.

POPULATION AND AGGREGATE PRODUCTION DATA

A 19-year population record (1960-1978) was compiled for each of the P-C regions established within the project area. The historical population data for this period was obtained from statistical bulletins that have been published by the counties on a quarterly or an annual basis. These statistics were presented in the form of county-wide census tract maps as shown in the example in Appendix B. Boundary lines for the P-C regions were then transferred to the census tract maps, and the populations of tracts located within each P-C region were totaled on a year-by-year basis. Annual aggregate production data for the years 1960-1978 were obtained from Evans and others (1979) as well as from individual mine operators in Ventura County.

Population projections for the years between 1979 and 2020 were made for each P-C region using area projections furnished by county governments, the State Department of Finance (1977), and the Southern California Association of Governments (1978). Population projections for the 10-year period between 2020 and 2030 were extrapolated by CDMG staff from previously mentioned data for the preceeding 41 years.

PER CAPITA CONSUMPTION OF AGGREGATE

Simple linear regression analyses of historical data were made to identify basic trends in the per capita consumption rates. The projected per capita consumption rates of each P-C region were then related to respective regional population projections, on a yearly basis, to obtain the total aggregate needs of each P-C region to the year 2030.

Per capita consumption rates vary greatly among different P-C regions, apparently depending upon the degree of urban maturity reached. In the Los Angeles area, high per capita consumption rates were characteristic of P-C regions where the overall population density is relatively low and the rate of urban development is high. High consumption rates will probably be maintained in such P-C regions until growth rates decline with the onset of urban maturity. As indicated by production and population records in the Los Angeles area, per capita consumption then usually decreases, eventually leveling off to a general maintenance level.

Population and dwelling unit densities were computed for the 1960-1976 base period in order (1) to relate and explain differences in per capita consumption rates between the two P-C regions and (2) to estimate when changes might occur in the current per capita consumption trends of urbanizing P-C regions (population statistics furnished by the counties also report the estimated number of dwelling units per census tract; see Appendix B). The statistical compilation of dwelling units is limited to the years 1960, 1965, 1970, and 1976. In order to compute density figures, the acreage of each P-C region was determined by planimeter; larger areas not suited for urban development and areas set aside for other land uses were excluded. Graphical curves depicting the 16-year records of population density, dwelling unit density, and per capita consumption of each P-C region were constructed for comparison purposes. The above data for each P-C region is presented in the "Evaluation of Aggregate Resources" sections of Parts II and III of this report.

REPORT SUMMARIES AND RECOMMENDATIONS

At the end of each of the following P-C region reports (Parts II and III), findings are summarized and recommendations are made to the State Mining and Geology Board. The 50-year forecasts of aggregate needs of a P-C region are compared with aggregate resources estimated to be present and available within the P-C region. (Areas of aggregate "availability" are shown as sectors on Plate 2.3 of this report.) Both the possibility of using resources from adjacent P-C regions and the potential for use of alternative materials (for example, crushed rock) are considered. These facts are brought together by the California Division of Mines and Geology (CDMG) to apprise the Mining and Geology Board of the options that are available to provide for future resource needs and to enable the Board to consider alternative choices for designation. Final determination of the designated areas will be made by the Board after consultation with lead agencies.

OVERVIEW OF AGGREGATES

Uses

Sand, gravel, and crushed rock are included among mineral commodities classed as "Construction Materials." These commodities, collectively referred to as aggregates, provide bulk and strength to Portland cement concrete, asphaltic concrete, and plaster or stucco. Aggregates are also used as road base, subbase, and fill. Aggregates normally provide from 80 to 100 percent of the material by volume in the above uses.

Economic Significance

The economic significance of aggregate arises from its use as a basic building material. It is all but indispensable in modern construction. Developers, building and freeway/road contractors, cement manufacturers, asphalt producers, carpenters, electricians, truck drivers, and mechanics, to name only a few, depend directly or indirectly on the flow of aggregate.

Aggregate production is a major industry in the Ventura area. Between 1971 and 1975, an average of 4 1/2 million tons of aggregate were produced and consumed there each year. Aggregate sells (1979 rates) generally at prices ranging from two to five dollars per ton at the plant site after washing, sizing, and stockpiling. Aggregate delivered to the consumer costs considerably more. The cost of delivered aggregate includes the plant-site cost plus charges for handling, haulage, and mixing. The haulage charge is the most influential factor determining the cost of the final product at delivery point. The availability of aggregate from local sources is therefore critical—not only to the construction industry, but to the general economic strength of the Ventura area.

Development and Production

In past years, as mentioned above, the population centers in the Ventura area have been served from local deposits of aggregate materials. However, deposits are rapidly being depleted and some of the potential sources have been lost to irreversible land uses incompatible with mining, such as home developments.

QUALITY SPECIFICATIONS

Rarely is aggregate raw material at the pit or quarry site, even from the highest grade deposits, physically or chemically suited for every type of aggregate use. Therefore, every potential deposit must be tested to determine how large a tonnage of its various components can meet specifications for a particular type of use and what processing is required.

Specifications for various uses of aggregate material have been established by several agencies, such as the Water and Power Resources Service (formerly U.S. Bureau of Reclamation), the U.S. Army Corps of Engineers, and the California Department of Transportation (Caltrans), to ensure that aggregate is satisfactory for particular uses. These agencies, as well as other major consumers of concrete, evaluate aggregate for acceptance by using standard test procedures outlined by such organizations as the American Society for Testing Materials and the American Association of State Highway Officials.

Most aggregate specifications have been established to ensure the manufacture of strong, durable concrete that will withstand the physical and chemical effects of weather and use. For example, specifications for concrete and base products prohibit or limit the use of rock materials containing mineral substances such as gypsum, zeolite, pyrite, opal, chalcedony, chert, siliceous shale, volcanic glass, and some acidic volcanic rocks. Gypsum shortens the setting time of cement, pyrite dissociates to yield sulfuric acid and iron oxide stain, and the other substances contain silica in a form that reacts with alkali substances in the cement to cause deterioration of concrete.

Specifications also call for various grain-size ranges and particle-size distributions in the various uses of aggregate. For some uses, such as asphalt paving, particle shape is specified. Specification standards set by the California Department of Transportation in 1975 require that at least 25 percent by weight of coarse aggregate (3/4-inch minus material retained on the No. 4 sieve) used as Class 2 aggregate base material shall be crushed particles. Furthermore, aggregate material (screenings) used with bituminous binder to form sealing coats on road surfaces shall consist of at least 90 percent by weight of crushed particles. Crushed stone is preferable to natural gravel in asphaltic concrete because broken surfaces adhere to asphalt better than rounded surfaces and the interlocking of angular particles strengthens the asphaltic concrete.

Aggregates for asphaltic concrete and Portland cement concrete generally meet the same physical and chemical requirements. In localities where only the one type of aggregate is readily available, that type is ordinarily used in both types of concrete; however, all material from the Ventura area cannot be used in high use categories such as the Portand cement concrete use. Most crushed rock that is produced in the Ventura area for use in asphaltic concrete is obtained from alluvial deposits. At most of the larger sand and gravel plants, oversize rock clasts (usually larger than 1 1/2 inch diameter) are screened from the alluvial raw material and crushed for use as crushed stone.

PRODUCTION COSTS

Production costs include the cost of mining and processing raw materials for use as aggregate and also the ensuing costs when utilizing the finished aggregate material in various final products (Portland cement concrete, asphaltic concrete, etc.). These costs can vary greatly, depending on the type of the deposit, character of the deposit, and the end use of the finished aggregate.

UTILIZATION COSTS

The preferred use of one aggregate material over another in construction practices depends not only on specification standards but also on economics. Alluvial sand and gravel is preferred to crushed stone for Portland cement concrete aggregate because the natural material is less expensive and because a wet mix made with rounded particles of alluvial sand and gravel has better workability than one made with angular particles. The workability of a wet mix consisting of Portland cement with crushed rock aggregate is improved by adding more sand and water. However, this also requires that more cement be added to the mix in order to maintain concrete durability standards. Normally, the additional cement amounts to about a quarter sack per yard of concrete, an additional cost of about $0.75 per yard of mix (1978 prices).

Crushed rock is commonly used for Portland cement concrete aggregate under geologic conditions where shortages of alluvial sand and gravel exist. Although slightly more care is required in pouring and placing a wet mix that contains crushed rock, Portland cement concrete made with this aggregate is as satisfactory as that made with sand and gravel of comparable rock quality; however, production costs are considerably greater, and the use of crushed rock in regions such as the Ventura area would involve additional haulage costs, truck traffic, and fuel consumption.

PART II

CLASSIFICATION OF SAND, GRAVEL, AND CRUSHED ROCK RESOURCE AREAS SIMI PRODUCTION-CONSUMPTION REGION

INTRODUCTION

Land in the Simi Production-Consumption (P-C) Region of Ventura County has been classified by the California Division of Mines and Geology (CDMG) according to the presence or absence of significant sand and gravel deposits and crushed rock source areas (Plate 2.1). The land classification is presented in the form of Mineral Resource Zones (MRZ's) that are shown on 12 of the 24 U.S. Geological Survey topographic base maps which accompany this report. Figure 1.5 and Table 2.1 are indexed to the quadrangle maps covering the Simi P-C Region. The lead agencies located within the Simi P-C Region are listed on Table 2.2.

ESTABLISHMENT OF MINERAL RESOURCE ZONES

Mineral Resource Zones within the Simi P-C Region are established on the basis of an aggregate-resource appraisal which includes: an analysis of geologic reports and maps; field investigations and examination of active sand and gravel mining operations; analyses of drill hole data; interpretation of aerial photographs; and evaluation of private company data.

The Mineral Resource Zones depicted on Plates 1.1 through 1.24 were established based on the suitability of the deposits for use as Portland cement concrete (PCC) aggregate. Lower quality aggregate resources, acceptable for use as asphaltic concrete aggregate, construction sub-base, railroad ballast, etc., have not been zoned independently on the plates, but are evaluated only where they occur in conjunction with PCC aggregate. They are discussed under Resource Sectors A-C and shown on Table 2.3.

Areas Classified MRZ-1

Several areas located within the Simi P-C Region have been classified MRZ-1 (Plate 2.1). These are areas where adequate information indicates that no significant mineral deposits are present or where it is judged that little likelihood exists for their presence ("Guidelines for Classification and Designation of Mineral Lands," Appendix A-3, p. 51).

These areas occur mainly within the Simi Valley, Little Simi Valley, and several other small valleys in the eastern part of the county, as well as in mountainous areas underlain by particular bedrock formations. Drill hole data and field observations indicate that these latter areas are underlain by sedimentary deposits composed predominantly of fine-grained material unsuitable for use as or in aggregate.

Areas Classified MRZ-2

Two areas within the Simi P-C Region have been classified MRZ-2 (Plate 2.1). These are areas where adequate information indicates that significant mineral deposits are present or where it is judged that a high likelihood for their presence exists ("Guidelines for Classification and Designation of Mineral Lands," Appendix A-3, p. 51).

Table 2.1 List of U.S. Geological Survey 7-1/2 minute quadrangles covering the Simi P-C Region (Plates 1.10-1.14, 1.17-1.20, and 1.22-1.24). Quadrangles show existing urbanized areas, urbanizing areas, Mineral Resources Zones (MRZ), and well log locations. Quadrangles are indexed on Figure 1.4 by the following number list.

10. Santa Paula	14. Oat Mtn.	20. Canoga Park
11. Moorpark	17. Newbury Park	22. Triunfo Pass
12. Simi	18. Thousand Oaks	23. Point Dume
13. Santa Susana	19. Calabasas	24. Malibu Beach

Table 2.2 List of lead agencies (county and incorporated city governments) located within the Simi P-C Region. (Cities that have active aggregate operations within their jurisdictional boundaries are denoted by asterisks. Cities that have land within their jurisdiction classified MRZ-2 are denoted by .

VENTURA COUNTY	LOS ANGELES COUNTY
Thousand Oaks Simi Valley	Los Angeles

The CDMG classified a deposit of sand and gravel or a particular bedrock unit as significant (MRZ-2) if it satisfied the criteria given in the "Guidelines" and met the following requirements:

1) The deposit must consist of sound, durable material substantially free of chemically reactive substances that would preclude its use for Portland cement concrete.
2) The geologic factors that resulted in the formation of the deposit must be understood clearly enough so that reasonable subsurface interpretation can be made from surface exposure of the material and from drill hole data.

The only deposits within the Simi P-C Region that satisfy these criteria are certain bedrock units of the Simi Conglomerate, the Saugus Formation, and the San Pedro Formation. Portions of these deposits are currently being mined and processed for aggregate uses (Plate 2.1, Figure 2.1).

Several different companies have mined aggregate within these areas for many years. Open-file reports compiled by the California Division of Mines and Geology show that aggregate was extracted as early as 1962 by Canyon Rock and Gravel Company north of the town of Simi. Presently, there are six companies producing aggregate within the P-C area.

About 2 miles southeast of the City of Simi, aggregate is extracted from the Simi conglomerate member of the Santa Susana Formation by S.P. Milling Company. Elsewhere, aggregate is extracted from the Saugus and San Pedro Formations at five separate localities. Approximately 5 miles northwest of the town of Moorpark and just east of Balcom Canyon, aggregate is produced from the San Pedro Formation by Somis Sand and Rock Company. About 3 1/2 miles north of Moorpark, Quality Rock Company and Blue Star Ready Mix, Inc. extract aggregate from the Saugus Formation. Similar material is produced by Tapo Rock and Sand Company and by P.W. Gillibrand Company at sites located approximately 5 miles northeast of the city of Simi.

SAUGUS FORMATION

The Pliocene-Pleistocene Saugus Formation is distributed along a broad east-west arcuate band extending westward from Los Angeles County to somewhat west of Grimes Canyon, where the Saugus Formation merges into the San Pedro Formation. Outcrops of the Saugus Formation are also present in the southwestern part of the Simi P-C Region and in the eastern part of the adjacent Western Ventura County P-C Region. (See Figure 2.1 and Plates 1.11., 1.12, and 1.13 for MRZ-2 locations.)

Apparent deltaic deposits of sandstone, pebbley sandstone, and conglomerate that make up the Saugus Formation grade downward into fine- to medium-grained, clayey sandstone and siltstone of esturine origin (Weber and others, 1972). Several exposures in outcrops and mine workings show that there is considerable variability in grain size distribution, both laterally and vertically within the formation. The coarse fraction (pebbles, cobbles, and boulders) is composed of several varieties of granite, gabbro, and anorthosite, while the fine fraction is made up of feldspathic sands. The presence of anorthosite and gabbro particles suggests that a major portion of the coarse-grain particles within the Saugus Formation originated from the San Gabriel Mountains to the east. It is estimated that about 15 percent of the Saugus Formation, where it is currently being mined, is composed of relatively durable coarse particles (pebbles, cobbles, and boulders) suitable for Portland cement aggregate.

The Saugus Formation has been deformed by folding and dislocated by faults over much of its extent. Typically, it displays dips ranging from about 15 to 45 degrees. This characteristic may affect the amount of resources that can be recovered at any specific locality.

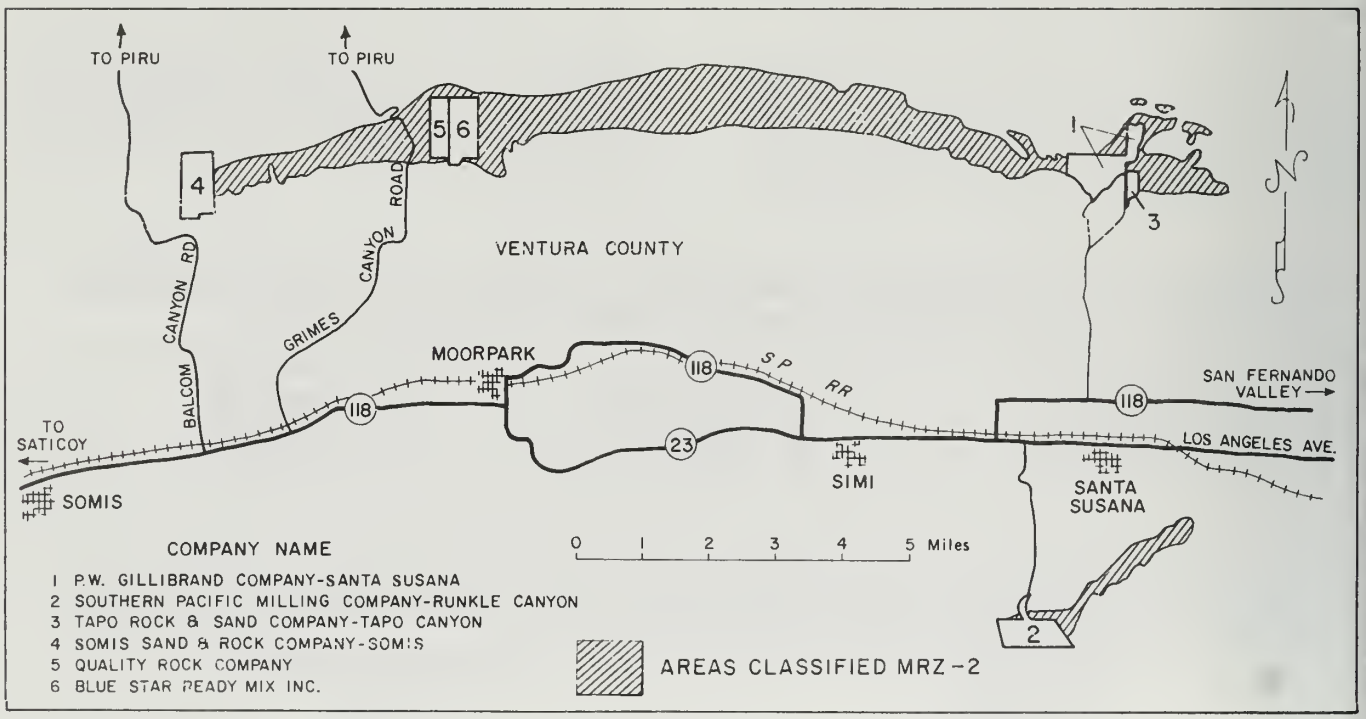


Figure 2.1 Sketch map of the Simi production district showing land owned or leased by aggregate companies as of November 1979 (revised from Evans and others, 1979). (See Plates 2.2 a-d for more detailed maps showing company-owned properties, and Plates 1.11, 1.12, 1.13,and 1.19 for MRZ-2 locations.)

SAN PEDRO FORMATION

The Pliocene-Pleistocene San Pedro Formation merges into the Saugus Formation in the western part of the Simi P-C Region (see Figure 2.1 and Plate 1.11 for MRZ-2 locations). It is composed of silty sands, interbedded sands, pebbly sands, and conglomerate. Field observations of outcrops and mine workings indicate that the formation, as a whole, is probably made up of finer particle sizes than the Saugus Formation. The coarser beds typically occur as discontinuous beds and lenses, which represent about 10 to 15 percent of the formation. Exposures of mine workings show that the coarse fraction is composed of well-rounded durable pebbles, cobbles, and boulders with pebbles predominating. It is made up of particles consisting of dense sandstone, quartz-feldspar schists, and minor amounts of volcanic rocks like the Saugus Formation. Deformation has limited the recoverability of aggregate resources from each of these units also.

SIMI CONGLOMERATE

The Simi Conglomerate is a basal member of the Paleocene-Eocene Santa Susana Formation. Outcrops of the Simi Conglomerate extend northeast from the Thousand Oaks area through Simi Hills to the northeastern side of Simi Valley. The major portion of the unit has been classified as MRZ-2. This zone extends southwest continuously along a 4-mile belt from the southeastern Simi Valley to the Runkle Canyon area, where it is presently being mined. (See Figure 2.1 and Plates 1.11 and 1.19 for MRZ-2 locations.) Beds within the deposit are composed chiefly of fresh durable cobble conglomerate consisting predominately of quartzites and granite clasts. The deposit is moderately to well indurated. Coarse material makes up approximately 60 percent of the deposit, although in the Runkle Canyon area the coarse fraction comprises as much as 70 percent in some parts of the deposit. Cobbles are well rounded, averaging about 3 inches in diameter. The maximum rock size observed was approximately 12 inches in diameter. Finer material (sand, silt, and clay) make up 30 to 40 percent of the deposit. The sandstone is largely feldspathic and is not suitable for use in concrete aggregate.

The apparent thickness of the Simi Conglomerate ranges from 650 feet at Meir Canyon to 1,200 feet at Oak Park Ranch to approximately 20 feet near Lang Ranch. The beds dip north and west from 20 to 50 degrees at the quarry site in Runkle Canyon. This fact has an important bearing on the cost of mining and the recoverability of resources where it is mined.

Aggregate is presently being extracted from the Simi Conglomerate in the vicinity of Runkle Canyon. Extraction began in 1966 by Simi Rock Products Company and was continued by Southern Pacific Milling Company in 1971. Operations have been continuous since that time.

Areas Classified MRZ-3

A substantial part of the Simi P-C Region has been classified MRZ-3 (Plate 2.1). Areas so classified are those containing mineral deposits, the significance of which cannot be evaluated from available data ("Guidelines," Appendix A-3, p.51) MRZ-3 areas located in valley regions within the Simi P-C Region are generally underlain by Quaternary alluvial deposits containing sand and gravel, but resource evaluations of these cannot be made because of inadequate subsurface data due to the inconclusiveness or unreliability of well-log data.

MRZ-3 areas located in hilly or mountainous terrane within the Simi P-C Region are generally underlain by Tertiary sedimentary/volcanic deposits. Many of these MRZ-3 areas are so classified because they are too small to reach threshold value (5,000,000 dollars FOB at the processing site) or because the suitability of the rock for aggregate could not be determined within the framework of the current study. Several deposits of rock suitable only for fill or base material have been or are being quarried. These deposits are classified MRZ-3 because they do not meet the requirements for MRZ-2 classification.

Some deposits that have been classified MRZ-3 are accompanied by the subscript "a" (see quadrangles). These deposits have been judged, on the basis of the limited available geologic data and field work, to have higher potential as sources of aggregate material suitable for Portland cement concrete than other deposits classified MRZ-3. These deposits, as well as other deposits classified MRZ-3, are discussed below.

SIMI CONGLOMERATE-SAN PEDRO AND SAUGUS FORMATIONS

Parts of the Simi Conglomerate and the San Pedro and Saugus Formations that have not been designated as MRZ-2 offer a high potential for yielding material suitable for concrete aggregate and are particularly worthy of detailed study and subsurface investigation. All three of these bedrock units are currently being mined for their aggregate content within the Simi P-C Region.

SANTA SUSANA, SESPE, TOWSLEY, LLAJAS, COLDWATER, VAQUEROS, AND PICO FORMATIONS

Several other bedrock units are known to contain beds or lenses of sandstone or conglomerate that could possibly yield limited tonnages of aggregate. These include parts of the Santa Susana, Sespe, and Topanga formations.

Other bedrock units that are believed to have a low potential as a source of concrete aggregate could also conceivably yield workable deposits, notably the Llajas, Coldwater, Vaqueros, Towsley, and Pico formations.

CONEJO VOLCANICS

The Conejo Volcanics have served as a source of crushed rock in the past, and could very likely serve as a source in the future. However, the presence of zeolites within many of the volcanic members would preclude their use as a source of crushed rock suitable for concrete aggregate. A systematic study would have to be made to determine which of the volcanic members might be suitable for Portland cement concrete aggregate.

ARROYO SIMI ALLUVIUM

Limited subsurface information has shown that parts of the Arroyo Simi alluvium between Moorpark and the City of Simi contain sand and gravel to depths as great as 135 feet. Considerable subsurface investigation and material testing is required before an assessment can be made of whether or not a suitable source of concrete aggregate is present within this area.

Areas Classified MRZ-4

Areas classified MRZ-4 are those areas where available information is inadequate for assignment to any other MRZ category ("Guidelines," Appendix A-3, p.51).

EVALUATION OF AGGREGATE RESOURCES IN THE SIMI P-C REGION

Introduction

An analysis of aggregate supply in the Simi P-C Region is presented in this section of the report. It was conducted on the basis of a quantitative evaluation of the aggregate resources contained within the P-C region. A similar evaluation was made of aggregate resources in the adjacent P-C regions (the San Fernando Valley P-C Region in Los Angeles County and the Western Ventura County P-C Region in Ventura County) in order to determine what effects these regions might have on the availability of aggregate in the Simi P-C Region. A less detailed preliminary evaluation was made for the adjacent Saugus-Newhall P-C Region as well. These latter evaluations are presented in the "Alternative Sources of Aggregate" section, beginning on page 20.

Data Base

For any appraisal of a resource to have credibility, it must be based upon sound data. If the data base is weak, the resource appraisal must indicate this fact and, conversely, if it is strong this should also be noted. For this project, the terminology used to reflect the confidence level of the data base has been adapted from U.S. Geological Survey Bulletin 1450-A, which is included herein as Appendix C. The two most important terms used are *reserves* and *resources*. Reserves are aggregate materials believed to be acceptable for commercial use that exist within property boundaries owned or leased by an aggregate producing company and for which permission allowing extraction and processing has been granted by the proper authorities. Resources include reserves as well as all similar potentially useable aggregate materials that may be mined in the future, but for which no use permit allowing extraction has been granted, or for which development has not been definitely established to be feasible based upon current technological or economic conditions.

Regulatory Constraints on Mining

The majority of regulatory constraints on sand and gravel mining that limit the available resources in Ventura County are site specific. The restrictions are written in each conditional use permit issued to quarry operators by the County of Ventura Planning Department. In drafting a permit, the Planning Department must take into account many federal, state, and local agency regulations and consider any recommendations that those agencies make concerning their areas of authority.

The present constraints fall under the following general categories: restraints on final grading configurations; limits on water course alterations; biota habitat preservation measures; limitations to prevent damage to adjoining property; incompatible land-use planning designations; pollution controls; and reclamation requirements.

The following is a list of the various written codes and regulatory agencies that the Planning Department must address:

1) Uniform Building Code as adopted by the Ventura County Board of Supervisors. Limits the final grade on cut and fill slopes.
2) Ventura County Ordinance No. FC-18. Requires the approval of the Ventura County Flood Control Department to alter any water course.
3) Ventura County Ordinance Code, Division 8 - Planning, Chapter 5, Article 1, Section 8163-3. Presents a set of general standards with which all permitted operations on county land must comply. These standards deal with the compatibility of the operation with surrounding land uses, the possible effects on public safety, adjacent property values, and any other detrimental effects that the proposed activity might have on the environment or public health.
4) California State Department of Fish and Game Code. Authorizes Fish and Game personnel to require sand and gravel operations to minimize mining impact on fish and wildlife habitats.

The above requirements and agency policies have general applications and must be tailored to each site.

Factors Considered in Calculating Reserves and Resources

In determining which areas, if any, should be classified MRZ-2 (significant deposits present) and in calculating reserves and resources within areas so classified, the following parameters were used:

1) Material must meet the criteria given in the "Guidelines for Classification and Designation of Mineral Lands" (Appendix A-3).
2) The deposit must consist of sound, durable material substantially free of chemically reactive substances that would preclude its use as Portland cement concrete (PCC) aggregate.
3) The basic geologic aspects of the deposit must be understood clearly enough to permit interpretation of the lateral and vertical distribution of the material.
4) It is assumed that there is an average of 0.07 short tons of aggregate per cubic foot of material.

Resource Sectors

All the aggregate resources in the Simi P-C Region identified as MRZ-2 occur within the Simi Conglomerate, the Saugus Formation, and the San Pedro Formation. Resource areas in which aggregate is currently being mined are placed into Sector A. Those portions of the Simi Conglomerate for which there is no permit allowing extraction and which are likely to contain aggregate resources of regional significance are included in Sector B. Sector C includes those portions of the Saugus-San Pedro Formations where it is likely that aggregate resources of regional significance are present.

SECTOR A

Sector A outlines all those areas within the Simi P-C Region from which aggregate is currently being extracted (Plate 2.2). This includes areas where aggregate is produced from the Simi

Conglomerate and the Saugus-San Pedro Formations by Blue Star Ready Mix, Inc., P.W. Gillibrand Co., Tapo Rock and Sand Co., Somis Sand and Rock, S.P. Milling Co., and Quality Rock Company (see Figure 2.1).

Before the amounts of aggregate reserves and resources within Sector A could be calculated, it was first necessary (1) to deduce the configurations of aggregate-bearing geologic units from knowledge of the geologic processes responsible for their formation, (2) to evaluate the history of mining operations in the Simi Conglomerate and the Saugus-San Pedro Formations, and (3) to learn both the effects of folding and faulting and the effects of technological constraints (slope requirements, drainage, etc.) on the recovery of reserves.

There is very little known about the source region for the Simi Conglomerate. The composition of the clasts within this formation bears little resemblance to that of any local source beds. Recent paleomagnetic studies by Kammerling and Lyendyk (1979) suggest that the entire Transverse Ranges, which would include all the Simi P-C Region, was rifted, rotated, and tectonically transported several hundred kilometers during Tertiary time. This would suggest that the source of the Simi Conglomerate lies at a considerable distance from the Simi P-C Region and that, therefore, any assessment of continuity for the conglomerate must be based purely on its present position and structural configuration.

The Simi Conglomerate is situated on a north-sloping hillside, and the unit displays a general northerly dip that ranges from slightly in excess of 20 degrees to over 50 degrees. These dips show that substantial amounts of the conglomerate descend beneath the overlying rocks to depths at which aggregate mining becomes economically unfeasible. Those portions are therefore unavailable as a resource.

Within the Simi Conglomerate, there are beds of feldspathic sandstone. This sandstone is not suitable for use in Portland cement concrete aggregate because it loses its cohesiveness when mixed with water. Consequently, it is not included in the resource evaluation. About 50 percent of the conglomerate beds are composed of fine particles unsuitable for concrete aggregate and, for this reason, are not included in the reserve figures. A density factor of 0.07 tons per cubic foot (14.3 cubic feet/ton) is used for calculations.

The Saugus and San Pedro Formations are of different geologic origin and therefore display a different pattern of distribution in both grain size and composition. A substantial portion, if not most of the sediments that are present within the Saugus Formation, originated from the San Gabriel Mountains as an alluvial deposit with the consequence that the coarser particles are more widely distributed in the eastern portions of the formation and the finer ones are more prevelant at its western extremity.

The San Pedro Formation is of marine origin, and it is quite likely that sediments within the formation were carried to the depositional site by long shore currents and, perhaps, in part from the nearby highland to the west and north. Local high and low energy regimes at the time of deposition, in conjunction with shifting of the original shorelines by eustatic sea level changes and tectonism, have very likely played a major role in sediment distribution. Such a mode of deposition would help account for the considerable variability of sediment sizes distributed laterally and vertically. This variability can now be observed in mine workings and outcrops.

Both the Saugus and San Pedro Formations have been folded and faulted. Because of this folding and faulting, portions of these formations are locally unrecoverable. Thus, portions of these formations that would otherwise be considered reserves or resources should not be so considered. However, because of the highly variable grain size distribution and the complications that folding and faulting have introduced on the local level, it is difficult to make an accurate evaluation of available resources in these formations. To do so would require fairly detailed drilling and grain size analysis. Such an undertaking was not possible, given the scope of the present study. Therefore, resource determinations were made based on assumptions of continuity of the individual formations and on estimations of overall grain size distribution based on field observations of outcrops and mine exposures.

Reserve calculations for Sector A are based on the following assumptions:

1) A slope requirement of 2:1 is used down to the local drainage level of the operating properties in the Saugus and San Pedro Formations, and a slope of 1:1 down to the pit wall convergence depth is used for the operating property in the Santa Susana Formation (Simi Conglomerate).
2) A waste factor of 15 percent is used for resource calculation.
3) The in-place density of the resource is assumed to be 0.07 tons per cubic foot (14.3 ft^3 per ton).

Based upon these factors, there are an estimated 170 million tons (Table 2.3) of inferred reserves and 2 million tons of indicated reserves within Sector A. The inferred reserves figure is subdivided into three categories: fine aggregate suitable for Portland cement concrete (80 million tons); coarse aggregate suitable for Portland cement concrete aggregate (50 million tons); and fine aggregate suitable for base and asphaltic concrete (40 million tons).

SECTOR B

Sector B includes a major portion of the Simi Conglomerate which lies outside the areas currently held for extraction of sand and gravel. This sector extends southwesterly for a distance of approximately 4 miles from southeastern Simi Valley to the Runkle Canyon area.

Subsurface data was unavailable for the area; consequently, geologic map interpretation and field investigations were performed to identify the material underlying Sector B. Outcrops along the sector area are minimal, but close examination of these exposures shows that the major portion of Sector B contains fresh, durable, cobble conglomerate that appears to be similar to the conglomerate currently being mined in the Runkle Canyon area of Sector A.

Resource calculations for Sector B are based upon the following assumptions:

1) There is an overall continuity of the Simi Conglomerate in the area shown as Sector B (Plate 2.2). This area encompasses approximately 1.6 square miles.
2) A 50 percent waste factor is used for resource calculation. Of this waste, an estimated 65 to 70 percent consists of discrete beds of sandstone and 30 to 35 percent consist of sands, silts, and clays within the conglomerate beds.

Table 2.3 Aggregate resources of the Simi P-C region (all numbers in million short tons). See Appendix C for definitions of terms used in this table.

SECTOR	RESOURCES						TOTAL
	RESOURCES COVERED BY USE PERMIT (Inferred Reserves)			RESOURCES NOT COVERED BY USE PERMIT (Inferred Resources)			
	Fine aggregate suitable for base & asphaltic concrete	Fine aggregate suitable for PCC	Coarse aggregate suitable for PCC	Fine aggregate suitable for base & asphaltic concrete	Fine aggregate suitable for PCC	Coarse aggregate suitable for PCC	
A	40	80	50	none	none	10	180
B	none	none	none	80	none	430	510
C	none	none	none	140	290	110	540
TOTAL	40	80	50	200*	300*	550*	1200**

* Figures rounded off to nearest 50 million.
** Figures rounded off to nearest 100 million.
PCC Portland Cement Concrete.

3) Approximately 85 percent of the resource can be used for Portland cement concrete aggregate.
4) The in-place density of the resource is assumed to be 0.07 tons per cubic foot (approximately 14.3 ft^3 per ton).
5) The conglomerate can be mined to a depth at which the pit walls converge.
6) A 1:1 slope is used for the hanging wall (north side) of the deposit.
7) The foot wall (south side) is controlled by the angle of dip, which averages approximately 25 percent.

Based upon the above parameters, there are approximately 510 million tons of inferred resources underlying Sector B (see Table 2.3). This figure is subdivided into two categories: coarse aggregate suitable for Portland cement concrete (430 million tons) and fine aggregate suitable for base and asphaltic concrete (80 million ton).

SECTOR C

Sector C includes all those portions of the Saugus-San Pedro Formations outside of the areas currently held for extraction of sand and gravel which are deemed likely to contain deposits suitable for concrete aggregate. Resource calculations are based upon the following assumptions:

1) There is an overall continuity of the Saugus-San Pedro Formations, representing about 14 square miles, as shown on Plate 2.2.
2) Based upon the evaluation of exposures of aggregate that were viewed in the field and at mine sites, it is estimated that about 25 percent of the 14 square miles contain a workable deposit.
3) Silt and clay size particles are considered to be waste; they amount to 20 percent of the mineable area.
4) Processed material would yield 80 percent sand and 20 percent coarse aggregate (pebbles, cobbles, and boulders).
5) The in-place density of the resource is assumed to be 0.07 tons per cubic foot (approximately 14.3 ft^3 per ton).
6) It is assumed that material can be mined to a minimum depth of 100 feet without causing undue harm to the land such as disruption of major drainage systems.

Based upon the above parameters, there are 3.5 square miles of area from which aggregate would be available to a depth of 100 feet. This yields 154 million tons of aggregate per square mile or a total of approximately 540 million tons after allowing 20 percent for waste. This total reserve figure of 540 million is subdivided into three categories on Table 2.3: coarse aggregate suitable for Portland cement concrete (110 million tons); fine aggregate suitable for Portland cement concrete aggregate (290 million tons); and fine aggregate suitable for base and asphaltic concrete (140 million tons).

The approximate nature of these resource estimates needs to be emphasized. It must be born in mind that, although it is estimated that about 25 percent of the 14 square miles contains a workable aggregate deposit, this figure is based upon visual estimates of suitable materials that were seen in exposures at outcrops and mine workings. More detailed evaluation and measurements may well show this estimate to be in error. Furthermore, there are no provisions for giving quantitative expression to the tons of resources affected by structural dislocations that would preclude mining at specific localities. Finally, it must be born in mind that the minimum depth of mining could easily exceed 100 feet at any given locality. In other words, there is considerable uncertainty inherent in these resource estimates.

ESTIMATED 50-YEAR CONSUMPTION OF AGGREGATE

The total projected consumption of aggregate in the Simi P-C Region for the next 50 years is estimated to be 130 million tons (Table 2.4).

Population and Aggregate Production Records

Population and aggregate production records were compiled for the years 1960-1978 for the Simi P-C Region (Figure 2.2). Records for the years prior to 1960 are in most cases incomplete. Records of population and aggregate production from 1960 to 1976 were also compiled for the adjacent P-C regions (Figures 2.3-2.5). Population projections to the year 2030 are presented in Figure 2.6.

Per Capita Consumption Rates

Annual per capita consumption of aggregate in the Simi P-C Region averaged 5.5 tons between 1961 and 1977 (Figure 2.7). The per capita consumption rate was correlated with the population projections for the Simi P-C Region in order to estimate aggregate consumption needs to the year 2030 (Table 2.4). Similar estimates were made for the adjacent P-C regions (Figure 2.8-2.10).

POPULATION AND DWELLING UNIT DENSITIES

Population and dwelling unit densities of the Simi P-C Region are relatively low when compared to those of the adjacent San Fernando Valley P-C Region (Figures 2.11 and 2.12). The relatively high densities of the San Fernando Valley P-C Region reflect the more mature urban area conditions (limited growth space) of the western Los Angeles basin-San Fernando Valley metropolitan areas. The relatively low per capita consumption rates of 1.6 tons per year in the San Fernando Valley P-C Region (Figure 2.9), compared to the per capita consumption rates of the other P-C regions, apparently indicates the establishment of normal (urban maturity) maintenance levels in that P-C region. This conclusion is based on comparisons of data from six P-C regions in the greater Los Angeles area. The relatively low population and dwelling unit densities of the Simi P-C Region thus suggest high growth potential in the forthcoming years. Based on data obtained from the Ventura County Planning Department, the Southern California Association of Governments (1978), and the California State Department of Finance and CDMG extrapolation for the period between 2020 and 2030, population in the Simi P-C Region is expected to increase from about 315, 000 in 1980 to over 645,000 in the year 2030, an increase of 105 percent. According to Ventura County (1978), the fastest growing cities in Ventura County are projected to be Thousand Oaks (89.9 percent increase by year 2000) and Oxnard (72.4 percent by year 2000). Within the unincorporated areas, Oak Park and Moorpark will absorb most of the new development. Generally, the greatest growth is expected to occur in the eastern parts of the county and in the larger cities. Except for Oak Park and Moorpark, virtually all future growth will occur within or adjacent to existing cities.

FACTORS AFFECTING PER CAPITA CONSUMPTION RATES

Per capita consumption of aggregate has varied with time and is different in each P-C region (Figures 2.7-2.10). Several factors, such as changes in urban growth with time, relative degrees of urban maturity, and major construction projects (for example, freeways) could account for the variations and differences.

The 1961-1967 per capita consumption record for the Simi P-C Region is marked by several distinguishable trends. These trends can be related directly to population growth rates over the 16-year time interval. From 1961 to 1968, population in the Simi P-C Region increased from about 92,000 to 194,882 (Figure 2.2), an increase of 112 percent during that 8-year period. Per

Table 2.4 Projected aggregate consumption (in million short tons) for the Simi, Western Ventura County, San Fernando Valley, and Saugus-Newhall P-C regions.

	SIMI P-C REGION		*WESTERN VENTURA COUNTY P-C REGION*		*SAN FERNANDO VALLEY P-C REGION*		*SAUGUS NEWHALL PC-REGION*	
	5 yr per capito consumption = 27.5 tons/person		*5 yr per capita consumption = 55 tons/person*		*5 yr per capita consumption = 8 tons/person*		*5 yr per capita consumption= 29.3 tons/person*	
YEARS	*Average Population (millions)*	*Aggregate Consumption* (million tons)*	*Average Population (millions)*	*Aggregate Consumption (million tons)*	*Average Population (millions)*	*Aggregate Consumption (million tons)*	*Averoge Population (millions)*	*Aggregote Consumption (million tons)*
1980-1985	0.34**	9	0.36	21	2.74	22	.080	5
1985-1990	0.37	10	0.40	23	2.80	22	.087	5
1990-1995	0.41	11	0.44	25	2.86	23	.092	6
1995-2000	0.44	12	0.48	27	2.91	23	.095	6
2000-2005	0.47	13	0.52	30	2.95	24	.098	6
2005-2010	0.51	14	0.57	32	2.97	24	.104	6
2010-2015	0.54	15	0.61	35	2.99	24	.110	7
2015-2020	0.57	16	0.65	37	3.01	24	.117	7
2020-2025	0.60	17	0.70	40	3.03	24	.122	8
2025-2030	0.63	17	0.73	41	3.05	24	.127	8
TOTAL		130 (80)****		310 (190)***		230 (140)***		60 (40)***

*Aggregate Consumption = population (5 years average) x 5 year per capita consumption. (Western Ventura County aggregate consumption includes an every five year export of one million tons to Santa Barbara County: for example, for the 1980-1985 period, (.36)(55) = 20 million tons + 1 million tons = 21 million tons.)

**Population projections based on data from Ventura County, the State Department of Finance (1977), and the Southern California Association of Governments (1978).

***Approximately 60% of the total aggregate demand will be for Portland cement concrete.

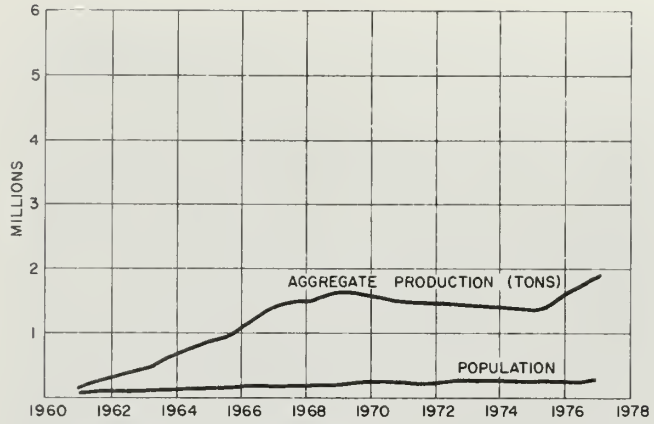


Figure 2.2 Simi P-C Region: population ond aggregote production records for years 1960-1976.

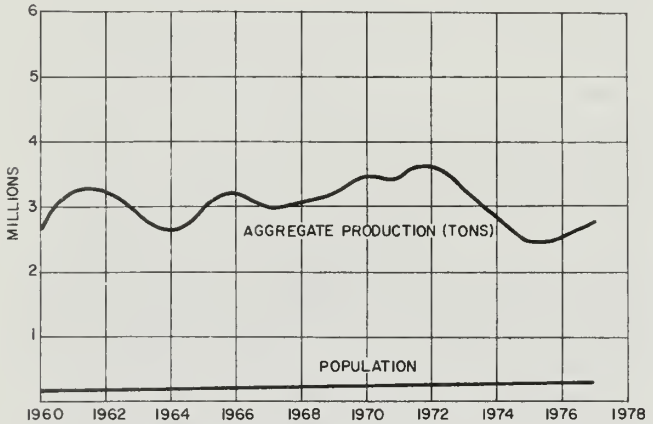


Figure 2.3 Western Venturo County P-C Region: populotion ond aggregate production record for yors 1960-1977.

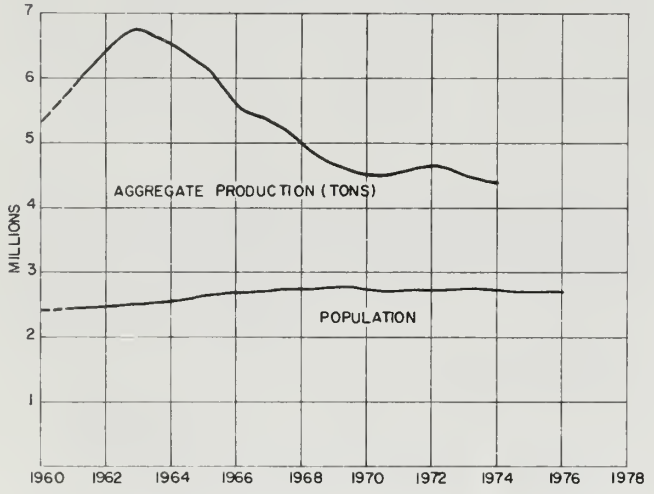


Figure 2.4 Son Fernanda P-C Region: populotion ond oggregote production record far years 1960-1976.

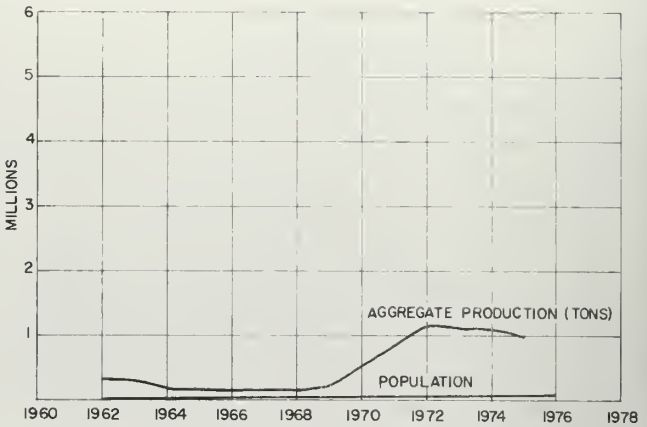


Figure 2.5 Sougus-Newhall P-C Region: populatian and aggregate records for yeors 1960-1976.

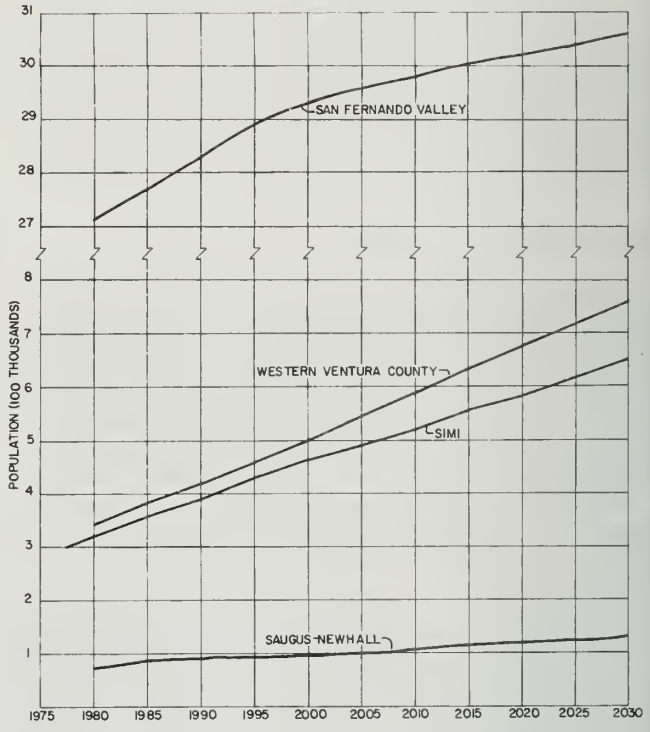


Figure 2.6 Projected populotions of the Simi, Western Ventura County, Sougus-Newhall, and Son Fernondo Volley P-C regions to the yeor 2030.

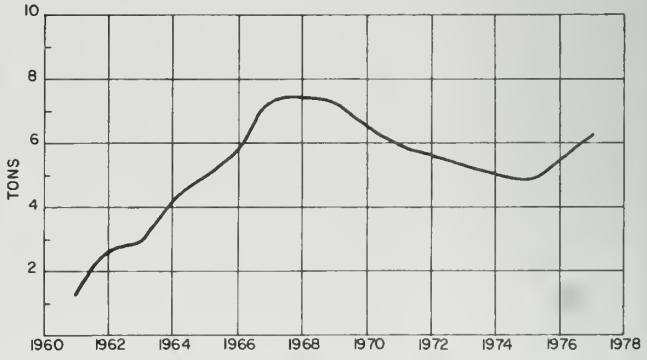


Figure 2.7 Annual per copita consumptian in the Simi P-C Region far years 1961-1977.

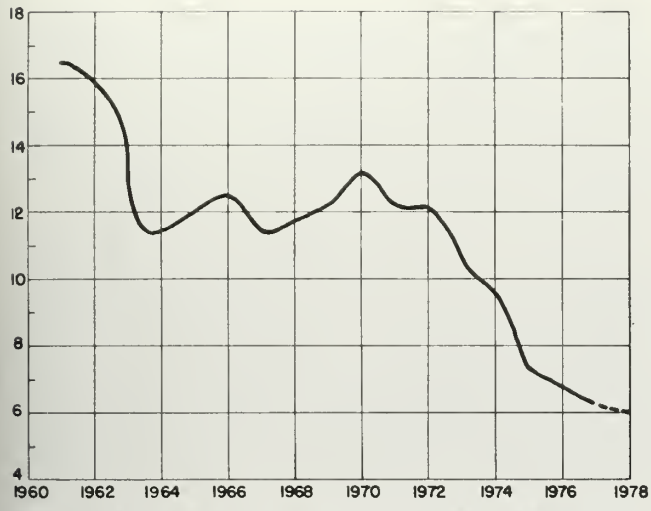


Figure 2.8 Annual per capita consumption in the Western Ventura County P-C Region for years 1961-1977.

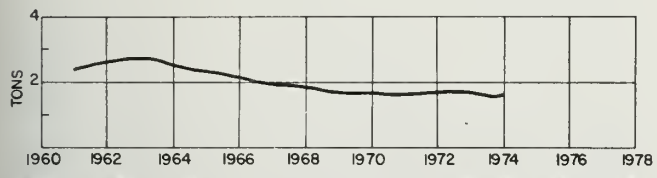


Figure 2.9 Annual per capita consumption of aggregate in the San Fernando Valley P-C Region for years 1961-1976.

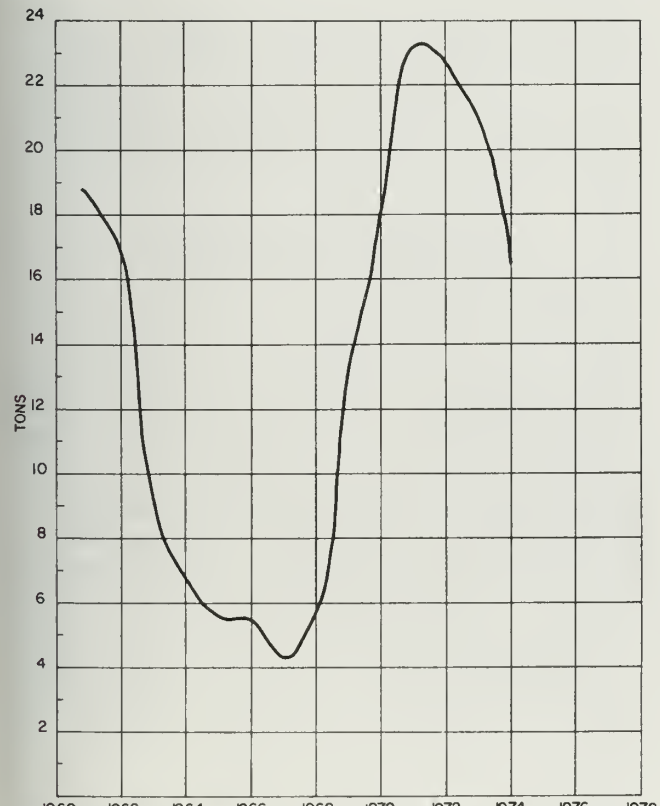


Figure 2.10 Annual per capita consumption of aggregate in the Saugus-Newhall P-C Region for years 1961-1974.

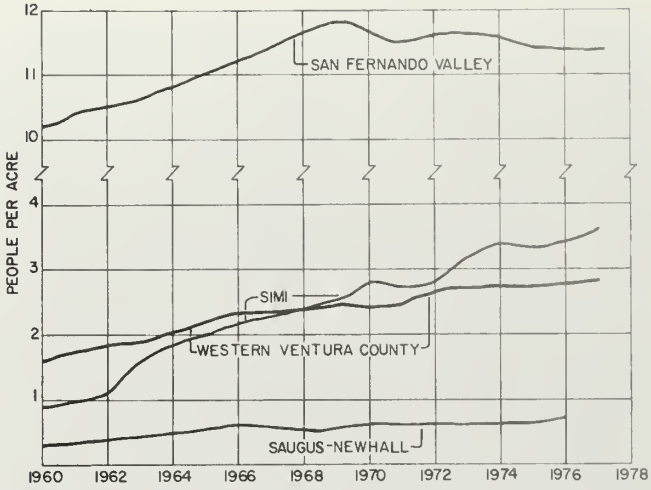


Figure 2.11 Comparison of population densities for Simi, Western Ventura County, Saugus-Newhall, and San Fernando Valley P-C regions for years 1960-1977.

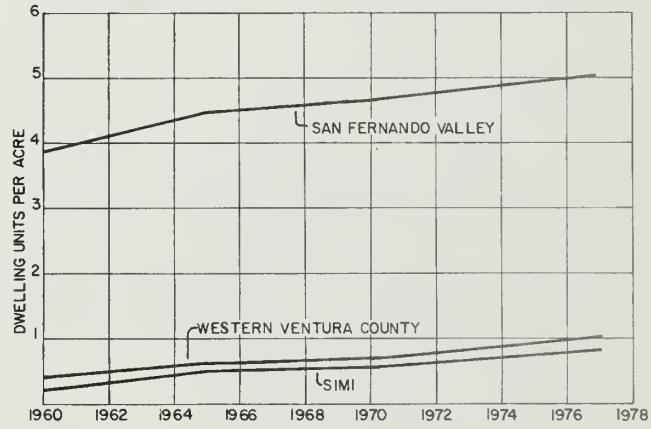


Figure 2.12 Comparison of dwelling unit densities for Simi, Western Ventura County, and San Fernando Valley P-C regions for years 1960-1977. (Data unavailable for the Saugus-Newhall P-C Region.)

capita consumption of aggregate during this 8-year interval steadily rose from 1.34 to 7.41 tons per person per year (Figure 2.7). From 1968 to 1975, also an 8-year period, population in the Simi P-C Region increased from 194,882 to 274,653 (Figure 2.2), an increase of 41 percent, which, in being far less than the percentage increase of the first interval, indicates a decline in the rate of population growth. During the more recent 8-year interval, per capita consumption of aggregate steadily decreased from 7.41 to 4.89 tons per year. During this period, while population continued to grow (but at a much slower rate than previously), yearly aggregate production levels remained relatively constant.

During the 3-year period of 1973 through 1975, population in the Simi P-C Region was increasing at about 5,000 persons per year. Between 1975 and 1977, the population growth rate increased to about 10,000 persons per year. This increase is also reflected in the sudden reverse in the yearly trend of average per capita consumption of aggregate, which climbed from 4.89 tons in 1975 to 5.52 in 1976 and finally to 6.24 in 1977. If population continues to grow at the present rate, it can be assumed that the per capita consumption rate will increase accordingly—at least until the rate of population growth declines.

The above discussion points out the general relationship that exists between population growth rates and the consumption of aggregate. On that basis, it is possible to forecast the total amount of aggregate that will be required to fill the needs of a particular consumption area within a specified time interval if projected per capita consumption rates are related to population growth rates for each year during the time interval. However, it is very difficult to forecast variances in annual growth rates and accompanying changes in per capita consumption rates into the future. Population projections are normally calculated on the basis of relatively steady growth rates which will have the effect of averaging out the future variances in annual population increases. Accordingly, the 16-year average annual per capita consumption of aggregate of 5.5 tons per person per year is used as the projected per capita consumption figure to calculate total aggregate needs of the Simi P-C Region to the year 2030.

Whether or not the annual per capita rate of aggregate consumption in the Simi P-C Region over the next fifty years will prove to be the same as the rate for this 16-year period cannot, of course, be said with certainty. A massive reconstruction project necessitated by an unforeseen disaster such as a major earthquake could increase the average annual consumption rate by as much as 100 percent. However, all known factors make the 5.5 tons per person per year rate the most likely probability.

Results based on the correlation between this figure and projected population growth for the region are shown on Table 2.4. The Simi P-C Region will require about 130 million tons of aggregate to satisfy its 50 year future requirements based upon an annual per capita consumption rate of 5.5 tons. About 60 percent of this would go into making Portland cement concrete aggregate as indicated by examination of private company data. In light of this, it can be anticipated that 80 million of the 130 million ton figure will be used as Portland cement concrete aggregate, of which about 50 percent or 40 million tons would be made up of coarse particles larger than 4 millimeters and about 40 million tons would be fine aggregate.

Although inspection of Table 2.4 would suggest that adequate reserves are available for the region based upon projected demand, this conclusion needs to be qualified. The distribution of coarse and fine aggregate is not uniform throughout Sector A. The Simi Conglomerate is deficient in fine aggregate; the Saugus-San Pedro Formations are deficient in coarse aggregate. However, both fine and course aggregate are needed to obtain the proper size mix for Portland cement concrete. Current mining operations are producing both fine and coarse aggregate from one geologic unit, but in time operations in the Simi Conglomerate will run out of fine material and have to transport it from sources in the Saugus-San Pedro Formations. Likewise, operations in the Saugus-San Pedro Formations in time will run out of coarse material and have to transport it from sources in the Simi Conglomerate. Neither of these sources alone is capable of supplying the necessary size distribution for Portland cement concrete over the next fifty years without causing major disruptive environmental and engineering problems at an excessive cost to the consuming public.

As indicated on Table 2.3, within the Simi P-C Region there are an estimated 50 million tons of coarse aggregate reserves and an estimated 120 million tons of fine aggregate reserves, 50 million tons of which is suitable for making Portland cement concrete. Therefore, it can be concluded that, if the per capita consumption remains constant for the region and if no new demands are made on reserves from adjacent regions, there is about 25 percent *more* coarse aggregate and about 25 percent *more* fine material than is needed for making Portland cement concrete. If, however, the consumption rate *increases* or experiences an accelerated rate of depletion through a draw down of reserves by adjacent P-C regions, then a short fall could easily occur. Furthermore, no account has been taken of the possibility that some of the reserves could be lost as a result of land in reserve areas being used in ways that preclude mining.

As shown in Table 2.3, there are over a billion tons of non-permitted resources (in areas not covered by a use permit allowing mining of aggregate) in the Simi P-C Region. Approximately 550 million tons of this represents coarse material suitable as a source of Portland cement concrete aggregate. It may be advisable for local agencies of the region to make provisions to set aside some, if not all, of these non-reserve resources as a contingency reserve. Such a reserve could meet future needs should existing reserves be depleted as a result of massive reconstructon following a major disaster.

ALTERNATIVE SOURCES OF AGGREGATE

Introduction

Potential sources of aggregate, in addition to those described in Sectors A, B, and C (Plate 2.2), occur in areas within and near the Simi P-C Region. These include resources in adjacent P-C regions, areas underlain by crystalline rocks, older Cenozoic sedimentary deposits, and offshore sand and gravel deposits (see Plate 2.3).

Except for the resources in adjacent P-C regions, too little is known about the physical and chemical properties (see Part I, "Overview of Aggregate") of alternative sources of aggregate to permit even crude resource estimates. However, a general discussion about the potential resources, their occurrence, and factors controlling their utilization is presented in the following section.

Sand and Gravel Resources of Adjacent P-C Regions

RESOURCE ESTIMATES

The resource estimates given in this report for the adjacent Saugus-Newhall P-C Region (Table 2.5 and Plate 2.1) represent a modification of data taken from California Division of Mines and Geology Special Report 139 (Evans and others, 1979). The *reserve* estimate is current to January 1979. The *resource* estimate was made using published geologic maps with reconnaissance field checking, including visits to sand and gravel plants operating in 1978. The following parameters were assumed in making these estimates:

1) Material density ranges from .060 to .065 short tons per cubic foot.
2) Waste does not exceed 25 percent.
3) Technology is presently available for economic extraction.
4) Estimates are limited to areas which are not urbanized and for which mining is still a possible interim land use.
5) In bedrock areas, the lowest depth of extraction would be such as to permit drainage of the mined area.

Table 2.5 Aggregate resources of the Simi, Western Ventura County, San Fernando Valley,and Saugus-Newhall P-C regions.

PRODUCTION-CONSUMPTION REGION	RESERVES (Million Tons)	RESOURCES (Million Tons)	TOTAL (Million Tons)
Simi	170	1000*	1200*
Western Ventura County	40	4900*	4900*
San Fernando Valley	40	720	760
Saugus-Newhall	200	230	430
CATEGORY TOTAL	450	6900*	
TOTAL RESERVES-RESOURCES Simi, Western Ventura County, San Fernando Valley and Saugus-Newhall:			7300*

*Figure rounded off to the nearest 100 million tons.

The *reserve* and *non-permitted resource* figures for the adjacent San Fernando Valley P-C Region are taken from California Division of Mines and Geology Special Report 143, Part II (Anderson and others, 1979). The *reserve* and *non-permitted resource* figures for the Western Ventura County P-C Region are taken from Part III herein. The estimated resources of the adjacent P-C regions are presented on Table 2.5.

Localities marked as PRZ-2 (Preliminary Resource Zone) on Plate 2.1 contain all of the known tentative MRZ-2 resource areas in the Saugus-Newhall P-C Region. Changes will most likely be made both in the resource estimations and the outlines of the zones after a more detailed study is completed at a later date.

ESTIMATED 50-YEAR CONSUMPTION OF AGGREGATE IN ADJACENT P-C REGIONS

Estimated 50-year aggregate needs for adjacent P-C regions are presented on Table 2.4. Comparison of Tables 2.4 and 2.5 shows that the projected 50-year total consumption of aggregate for each of the three adjacent P-C regions is less than their respective total *resource* estimates. However, the *reserves* alone in the Western Ventura County and San Fernando Valley P-C regions are not sufficient to supply the 50-year projected needs for aggregate. Consequently, these two P-C regions will be forced to acquire aggregate from their non-permitted resources or from supplies outside their regions. Either course is likely to have a major negative impact upon the Simi P-C Region's supply of aggregate.

Production from present sources in the adjacent P-C regions —San Fernando Valley, Western Ventura County, and Saugus-Newhall—represents the most immediate alternative source of aggregate. The disadvantages of increasing dependency on these sources in the future are increases in haulage costs, added air pollution attendent to longer haulages, and lack of control of those sources by the market population of the Simi P-C Region. The last disadvantage may become important when present reserves in adjacent P-C regions are depleted, which is projected to happen in the Western Ventura County and San Fernando Valley P-C regions within the 50-year projection period. Future aggregate supply from these regions, and perhaps the Saugus-Newhall P-C region as well, may depend on land-use decisions made without consideration of the aggregate needs of the Simi P-C Region.

Sedimentary Rocks as Alternative

Much of the Simi P-C Region is underlain by Tertiary sedimentary rocks (Plate 2.3). Oak Ridge, the Santa Susana Mountains, and the Las Posas, Camarillo, and Simi Hills are all composed primarily of Tertiary sedimentary rocks. Some of these sedimentary units are possible alternative sources of aggregate material.

Three Tertiary sedimentary formations—the Simi Conglomerate, the San Pedro Formation, and the Saugus Formation—are presently being mined for sand and gravel. They have sections that are classified as MRZ-3a in addition to the areas classified as MRZ-2. The subscript "a" has been added to these MRZ-3 areas to indicate their high potential. Suitable sources of aggregate may exist in those areas.

The Sespe Formation (classified as MRZ-3 in this report) is also a potential alternative aggregate source. Although in many areas the Sespe Formation contains an abundance of clayey silt and clayey sandstone layers, particularly within the Thousand Oaks-western Simi Valley area, there are localities where it consists of relatively clean sandstone and conglomerate. The conglomerate clasts are generally composed of well-rounded volcanic rock and granitic rock, along with minor shale and metamorphic rock. The conglomerate sections are weakly indurated and could probably be excavated with heavy equipment. It is noteworthy that about 70 miles to the southeast of the Simi P-C Region, in Orange County, a lens of Sespe Formaton conglomerate is being mined for aggregate material.

The Topanga Formation (classified as MRZ-3 in this report) is a potential alternative source of aggregate, especially in the Thousand Oaks-Bell Canyon area where it is known to contain beds of conglomerate. A detailed evaluation would have to be made to determine its suitability as a source of Portland cement concrete aggregate. It is reported that a significant percentage of the conglomerate is derived from the Conejo Volcanics, parts of which are suspected of being reactive with Portland cement and therefore, of being unsuitable for use in Portland cement concrete.

The Santa Susana Formation (classified as MRZ-3 in this report) is exposed in the Simi Hills and in an area northeast of Simi Valley. It may contain lenses of conglomerate of acceptable quality and extent for use as aggregate.

The Simi P-C Region is unique among the greater Los Angeles-Ventura County area P-C regions in that the only sources of aggregate within the region are bedrock sedimentary formations. In view of the very limited potential of stream bed deposits in the Simi P-C Region, the Tertiary sedimentary formations mentioned in this section are likely to become important alternative sources of local aggregate. Also, Tertiary sedimentary formations are located in areas not likely to feel the pressures of urbanization in the future.

Alluvial Sediments as Alternative

The creek bed of Arroyo Simi between the communities of Simi Valley and Moorpark is a potential limited source of aggregate (MRZ-3 in this report). The deposit is generally confined to the existing channel and may be as deep as 135 feet. There is no information on the quality of this sand and gravel, and its suitability for use in Portland cement concrete is in question.

Sources of Crushed Rock as Alternative

Tertiary volcanic rocks—the Conejo Volcanics—are exposed over large parts of the western and central Santa Monica Mountains area, and as far north as the west end of Simi Valley. This large deposit of middle Miocene volcanics is made up chiefly of basaltic and andesitic flows, breccias, tuffs and shallow intrusives. It is possible that some of this material might be crushed and processed into aggregate material if the rock is of acceptable quality.

These volcanic rocks have not been thoroughly evaluated for use as aggregate material; however, brief field examination and petrographic analysis of several rock samples indicate that rocks in this area have undergone widespread zeolitization. Volcanic rocks with high zeolite content are potentially reactive in concrete and, therefore, unsuitable for use as aggregate. Deuteric rock alteration could also affect the durability of the material. Exploration and testing is necessary to identify and delineate any resource suitable for crushed rock in this terrane.

LAND-USE FACTORS

Most of the volcanic rock exposed in the Santa Monica Mountains lies within the proposed boundaries of the Santa Monica Mountains National Recreation Area (NRA), which was established November 10, 1978, with passage of Public Law 95-625, Section 507 (Plate 1.1). The NRA is administered by the U.S. Department of the Interior through the National Park Service. Public Law 95-625 mandates that "The Secretary shall manage the recreation area in a manner which will preserve and enhance its scenic, natural and historical setting and its public health value as an airshed for the southern California metropolitan area while providing for the recreational and educational needs of the visiting public." Although the enabling legislation does not address mining activity specifically, Section 507(i) states: "In the administration of the recreation area, the Secretary may utilize such statutory authority available for the conservation and management of wildlife and natural resources as appropriate to carry out the purpose of this section. The fragile resource areas of the recreation area shall be administered on a low-intensity basis, as determined by the Secretary." Opportunities for future mining activity in this area seem uncertain at best.

ENVIRONMENTAL FACTORS

Major environmental factors that must be addressed when evaluating mining and processing of crushed rock for aggregate material are water and air quality, operational noise level, reclamation of mined land, and esthetics. The aggregate industry must meet rigorous city, county, state, and federal requirements to abate and mitigate degradation of the environment. Specific environmental concerns can vary from locality to locality depending on the nature of the surrounding environment. For instance, environmental issues regarding crushed rock aggregate operations in the western Simi Valley area that might be raised by the people in the surrounding residential sections would be related to dust, noise (blasting), and truck traffic resulting from plant operations. In unpopulated, undeveloped areas of the Santa Monica Mountains, esthetic quality, noise, water pollution, and disturbance of surrounding biota might be of greatest concern.

CONCLUSIONS AND RECOMMENDATIONS

Current reserves within the Simi P-C Region are adequate for supplying construction aggregate for the existing population of over 300,000 inhabitants and an anticipated population increase to over 600,000 by the year 2030. Based upon the projected population figures and using an average annual consumption rate of 5.5 tons per capita, approximately 130 million tons of aggregate will be required to satisfy the local demand. Current reserves are in excess of 170 million tons, which is an adequate amount to fulfill local requirements, provided reserves are made available from both the Simi Conglomerate and the Saugus-San Pedro Formations in order to obtain the proper balance of coarse and fine aggregate for Portland cement concrete. However, if consumption were to return to the 1968 high annual rate of consumption of 7.41 tons per capita, 180 million tons of aggregate would be required. This represents a shortfall of about 10 million tons.

As noted previously in this report, there are 170 million tons of aggregate reserves in Sector A, of which 50 million tons are coarse material suitable for Portland cement concrete and the balance of 120 million tons is fine aggregate (essentially sand), 50 million tons of which is suitable for making Portland cement concrete.

It is anticipated that over the next 50 years, about 130 million tons of aggregate will be needed to satisfy a per capita consumption of 5.5 tons per year for the projected population. About 60 percent of this will most likely be needed to make Portland cement concrete, which represents approximately 80 million tons. About 50 percent of the 80 million tons (40 million tons) would represent coarse aggregate. Therefore, it can be considered that Sector A contains an adequate amount of aggregate for its projected needs. However, because the material within this sector will be needed to meet the region's projected requirements for aggregate of a proper sizes distribution for Portland cement concrete, the CDMG recommends that the State Mining and Geology Board consider all of this sector for designation.

Consideration also needs to be given to the advisability of providing sufficient aggregate resources to allow for unforeseen circumstances, such as reconstruction in the wake of a major earthquake or similar disaster. In addition, it can be anticipated

that, if residents of the adjacent San Fernando Valley P-C Region fail to find a local source of aggregate to replace their region's rapidly depleting reserves (anticipated to be depleted in about 10 years), they are likely to use aggregate from the Simi P-C Region to meet much of their requirements. With the substantially higher population in the San Fernando P-C Region (about 2.5 million inhabitants compared to about 340,000 inhabitants of the Simi P-C Region) this development could lead to a significantly accelerated depletion rate for the Simi P-C Region.

Sector A contains a reasonable balance between coarse and fine aggregate. Sector B is well endowed with coarse aggregate, while Sector C is generally deficient in coarse material. Therefore, if measures are to be taken to provide for emergency contingences alluded to earlier or to provide for a draw down of reserves as a result of consumption by the adjacent San Fernando P-C Region, then particular consideration should be given to designating portions of both Sectors B and C. Neither of these two sectors alone can supply the proper balance between coarse and fine aggregate needed for making Portland cement concrete.

PART III

CLASSIFICATION OF SAND, GRAVEL, AND CRUSHED ROCK RESOURCE AREAS WESTERN VENTURA COUNTRY PRODUCTION-CONSUMPTION REGION

INTRODUCTION

Land in the Western Ventura County Production-Consumption (P-C) Region has been classified by the California Division of Mines and Geology (CDMG) according to the presence or absence of significant sand and gravel deposits and crushed rock source areas (Plate 2.1). The land classification is presented in the form of Mineral Resource Zones (MRZ's) on 18 of 24 U.S. Geological Survey topographic quadrangle base maps which accompany this report (Plates 1.1-1.24). Figure 1.3 and Table 3.1 are indexed to the quadrangle maps covering the Western Ventura County P-C Region. A list of lead agencies located within the Western Ventura County P-C Region is presented on Table 3.2.

ESTABLISHMENT OF MINERAL RESOURCE ZONES

Mineral Resource Zones within the Western Ventura County P-C Region were established on the basis of an aggregate resource appraisal which includes study of pertinent geologic reports and maps, field investigations, visits to active sand and gravel mining operations, analyses of drill hole data collected from the past 75 years, and inspection of aerial photographs and private company documents.

The Mineral Resource Zones depicted on Plates 1.1 through 1.24 were established based on the suitability of the deposits for use as Portland cement concrete (PCC) aggregate. Lower quality aggregate resources, acceptable for use as asphaltic concrete aggregate, construction sub-base, railroad ballast, etc., have not been zoned independently on the plates, but are evaluated only where they occur in conjunction with PCC aggregate. They are discussed under Resource Sectors A-J, and shown on Table 3.3.

Areas Classified MRZ-1

Several areas located within the Western Ventura County P-C Region have been classified MRZ-1. These are areas where adequate information indicates that no significant mineral deposits are present or where it is judged that little likelihood exists for their presence ("Guidelines for Classification and Designation of Mineral Lands," Appendix A-3, p. 51).

These areas occur mainly within the interior parts of the Oxnard plain, Santa Rosa Valley, other small valley areas, and in mountainous areas underlain by particular bedrock formations (Plate 2.1). Drill hole data and field observation indicate that these areas are underlain by sedimentary deposits composed predominently of fine-grained material unsuitable for use as aggregate.

Areas Classified MRZ-2

One area within the Western Ventura County P-C Region has been classified MRZ-2. In this area, adequate information indicates that significant material deposits are present or that a high likelihood for their presence exists ("Guidelines ," Appendix A-3, p. 51). The area mainly occurs within the Santa Clara River Valley, an elongate area about 27 miles long (Plate 2.1).

For a deposit of sand and gravel or a particular bedrock unit to be categorized as significant (MRZ-2), it must satisfy the

Table 3.1 List of U.S. Geological Survey 7-1/2 minute quadrangles covering the Western Ventura County P-C Region (Plates 1.1-1.13, 1.15-1.17, and 1.21-1.23). Quadrangles show existing urbanized areas urbanizing areas, Mineral Resource Zones (MRZ), and well log locations. Quadrangles are indexed on Figure 1.4 by the following list.

1. Matilija	7. Pitas Point	13. Santa Susana
2. Ojai	8. Ventura	15. Oxnard
3. Santa Paula Peak	9. Saticoy	16. Camarillo
4. Fillmore	10. Santa Paula	17. Newbury Park
5. Piru	11. Moorpark	21. Point Mugu
6. Val Verde	12. Simi	22. Triunfo Pass
		23. Point Dume

Table 3.2 List of lead agencies (county and incorporated city governments) located within the Western Ventura Counlty P-C Region. (Cities that have active aggregate operations within their jurisdictional boundaries are denoted by asterisks. Cities that have land within their jurisdiction classified MRZ-2 are denoted by ▲).

Santa Paula* ▲	Camarillo
Ventura ▲	Fillmore ▲
Port Hueneme	Ojai
Oxnard ▲	

criteria given in the "Guidelines for Classification and Designation of Mineral Lands" (Appendix A-3) as well as the following:

1) The deposit must consist of sound, durable material substantially free of chemically reactive substances that would preclude its use in Portland cement concrete.
2) The geologic factors that resulted in the formation of the deposit must be understood clearly enough so that reasonable subsurface interpretation can be made from surface exposures of the material and from drill hole data.
3) The particle grain size distribution required in Portland cement concrete must be present.

The only deposits within the Western Ventura County P-C Region that satisfy these criteria occur within the Santa Clara River Valley and within a small portion of the Oxnard Plain (Plate 2.1).

The Santa Clara River flows westerly from its headwaters in the San Gabriel Mountains near Soledad Pass, six miles south of Palmdale, California. The river flows through Ventura County in a westerly and southwesterly direction for a distance of about 36 miles. Numerous tributary streams join the Santa Clara River within Ventura County; the most significant of these are Piru Creek, Sespe Creek, and Santa Paul Creek. Detritus that has been transported by the river and its tributaries has been deposited along the Santa Clara River channel and on the adjacent floodplain to form a linear deposit ranging from 1 to 5 miles in width and up to 500 feet deep.

The coarse fraction of the deposit (particles greater than one quarter inch) decreases downstream with distance from the river's source. At Santa Paula, this fraction is estimated to be 40 to 45 percent coarse material, and it contains boulders that measure up to 3 feet in diameter. The aggregate is composed of approximately 40 percent reworked sandstones, 40 percent granitic rock, 10 percent Modelo or Monterey Formation shales,* and 10 percent metamorphic and volcanic rocks. Most of the reactive Monterey Shale has been introduced into the Santa Clara River deposits by the above mentioned major tributaries draining the mountainous area to the north. As a result, the amount of reactive material in the deposits theoretically decreases upstream. Records of aggregate production show that two companies were producing aggregate from three plants in the lower Santa Clara River-Ventura production district prior to 1925 (Tucker, 1925, p. 223-245). At present there are four companies operating from six properties within the district (Figure 3.1). The district includes the Santa Clara River between Santa Paula and El Rio, a distance of seven miles.

The plants market their products in southern Santa Barbara, Ventura, and western Los Angeles counties. All of the aggregate is hauled in trucks owned by the producing companies or by independent operators.

*These contain reactive opaline chert and soft, light diatomaceous shales; see aggregate specifications, Part I, "Overview of Aggregates."

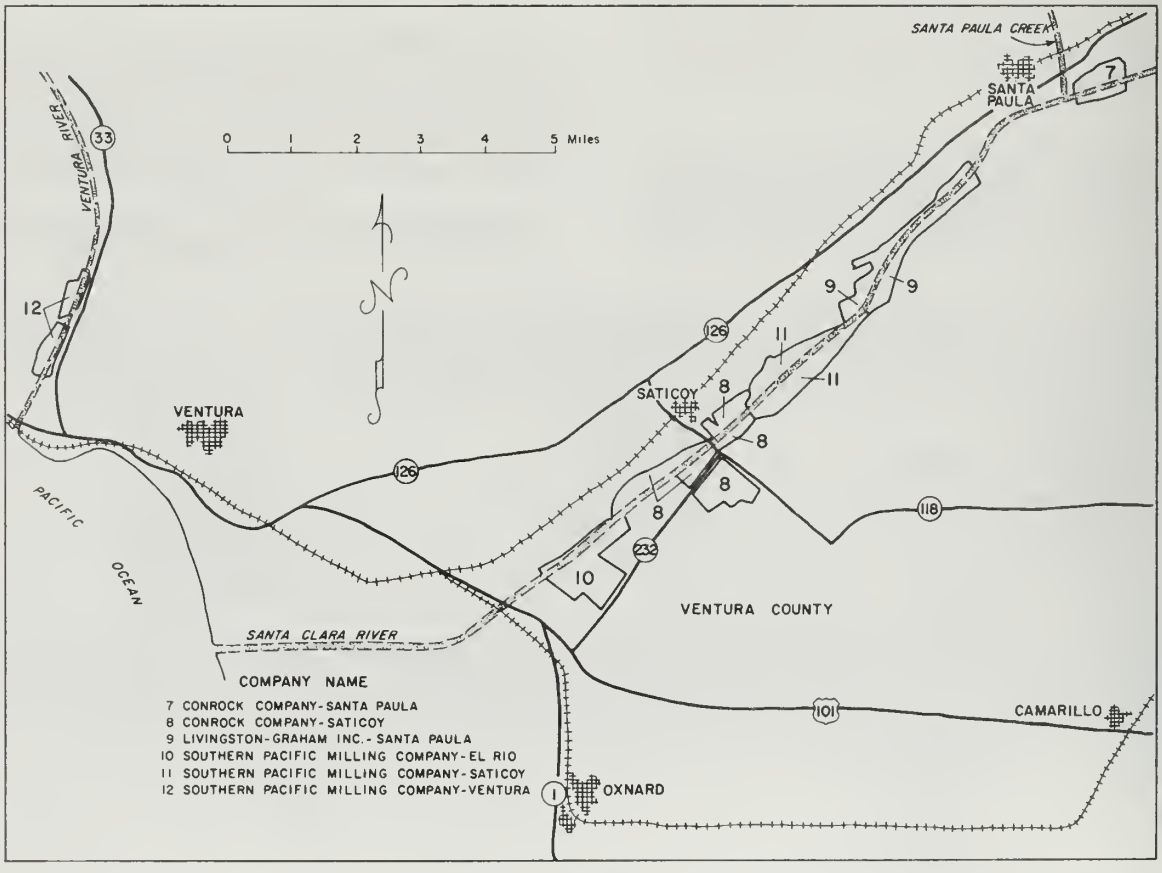


Figure 3.1 Sketch mop of the lower Santa Clara River productian district shawing land awned ar leased by aggregate companies as af Navember 1979 (fram Evans and others, 1979). (See Plates 1.9, 1.10, and 1.15 for MRZ-2 lacotians.)

Areas Classified MRZ-3

A substantial portion of the Western Ventura County P-C Region has been classified MRZ-3. Areas classified MRZ-3 are those areas containing mineral deposits, the significance of which cannot be evaluated from available data ("Guidelines," Appendix A-3, p. 51). MRZ-3 areas located in valley regions are generally underlain by Quaternary age alluvial deposits containing sand and gravel. Resource evaluations cannot be made because of inadequate subsurface data (well-log data is unavailable or available data is inconclusive or unreliable). MRZ-3 areas located in hilly or mountainous terrane are generally underlain by Tertiary sedimentary volcanic deposits.

Some deposits that have been classified MRZ-3 are shown by the subscript "a" (see quadrangles). Based upon the limited available geologic data and limited field work, these deposits have been judged to have relatively higher potential as sources of aggregate material suitable for use in Portland cement concrete. Areas within the Western Ventura County P-C Region that are classified MRZ-3 or MRZ-3(a) are discussed in the "Alternative Sources of Aggregate" section below.

Areas Classified MRZ-4

Several areas within the Western Ventura County P-C Region have been classified MRZ-4 (Plate 2.1). Areas about which available information is inadequate for assignment to any other MRZ zone are classified MRZ-4 ("Guidelines," Appendix A-3, p. 51).

EVALUATION OF AGGREGATE RESOURCES IN THE WESTERN VENTURA COUNTY P-C REGION

Introduction

An analysis of aggregate supply in the Western Ventura County P-C Region was conducted on the basis of a quantitative evaluation of aggregate resources there. A similar evaluation was made of aggregate resources of the adjacent Simi P-C Region. A similar, but less detailed evaluation was made in the adjacent Saugus-Newhall P-C Region, which will be classified at a later date (Plate 2.1). The adjacent P-C regions were evaluated to determine the effects that these regions might have on the availability of aggregate from sources in the Western Ventura County P-C Region. These latter evaluations are presented in the "Alternative Sources of Aggregate" section, beginning on page 35 .

Data Base

For any appraisal of a resource to have credibility, it must be based upon sound data. If the data base is weak, the resource appraisal must indicate this fact and, conversely, if it is strong this should also be noted. Terminology used to reflect the confidence level of the data base for this project has been adapted from U.S. Geological Survey Bulletin 1450-A (Appendix C). The terms *measured, indicated,* and *inferred,* as used in the discussion that follows, refer to both reserves and resources, as well as hypothetical resources. For this project, *reserves* represent material believed to be acceptable for commercial use that exists within property boundaries owned or leased by an aggregate producing company and for which permission allowing extraction and processing has been granted by the proper authorities. *Resources* include *reserves* as well as all potentially useable aggregate materials (non-permitted resources) which may be mined in the future, but for which no use permit allowing extaction has been granted, or for which development has not been definitely established to be feasible based upon current technological or economic conditions.

Much of the resource evaluation that follows is based on drill hole records. These drill holes were made over a time span extending back to the early part of this century. They describe the types of earth material (silt, sand, gravel, and bedrock types) encountered at various depths. The quality of drill hole descriptions range from poor to very good. Only drill hole records that contain descriptions judged to be acceptable for analysis were used in the present study.

Regulatory Constraints on Mining

The majority of regulatory constraints on sand and gravel mining that limit the available resources in Ventura County are site specific. The restrictions are written in each conditional use permit issued to quarry operators by the County of Ventura Planning Department. In drafting a permit, the Planning Department must take into account many federal, state, and local agency regulations and consider any recommendations that those agencies make concerning their areas of authority.

The present constraints fall under the following general categories: restraints on final grading configurations, limits on water course alterations, biota habitat preservation measures, limitations to prevent damage to adjoining property, incompatible land-use planning designations, pollution controls, and reclamation requirements.

The following is a list of the various codes, regulations, and directives that the Planning Department must address:

1) Ventura County Board of Supervisors Resolution FC-1. This is a set of requirments—adopted from the U.S. Army Corps of Engineers—that set the grading limits for excavations adjacent to the lower Santa Clara River levee.
2) Uniform Building Code as adopted by the Ventura County Board of Supervisors. This limits the final grade on cut and fill slopes.
3) Ventura County Ordinance No. FC-18. Requires the approval of the Ventura County Flood Control Department to alter any water course.
4) City of Oxnard Resolution 5007. Prohibits sand and gravel quarrying east of Vineyard Avenue within the city limits of Oxnard.
5) U.S. Environmental Protection Agency, 1972 Act (PL92-500), Section 208 as amended in 1977. Affects mining below the ground water level in the Oxnard Plain.
6) Ventura County Ordinance Code, Division 8 - Planning, Chapter 5, Article 1, Section 8163-3. Presents a set of general standards with which all permitted operations on county land must comply. These standards deal with the compatibility of the operation with surrounding land uses, the possible effects on public safety, effects on values of adjacent property, and any other detrimental effects that the proposed activity might have on the environment or public health.

7) California State Department of Fish and Game Code. Authorizes Fish and Game personnel to require sand and gravel operations to minimize mining impact on fish and wildlife habitats.
8) State of California Water Resources Control Board. Authorized by the State Water Code to regulate the water resources of the State. Presently the sea water intrusion of the Oxnard Plain aquifers is of major concern and may affect mining in the lower Santa Clara River by requiring mitigating measures that would severely limit sand and gravel extractions.
9) California Coastal Commission Shoreline Erosion Protection Policy to be administered by the County of Ventura. Requires the county to restrain any operation from reducing the transport of sediments to the beach unless counter measures are provided.

The adopted requirements of U.S. Army Corps of Engineers (FC-1) and the City of Oxnard's Resolution 5007 are the most explicit. The remaining requirements provide general policy which must be tailored to each site in the form of permit stipulations.

Factors Considered in Calculating Reserves and Resources

In determining which areas, if any, should be classified as MRZ-2 (significant deposits present) and in calculating reserves and resources within areas so classified, the following parameters were used:

1) Material meets the criteria given in the "Guidelines for Classification and Designation of Mineral Lands" (Appendix A-3).
2) The deposit consists of sound, durable material substantially free of chemically reactive substances that would preclude its use as a construction material.

In alluvial areas:

3) Combined clay and silt fraction does not exceed 25 percent by volume as determined from drill hole data.
4) The geologic factors that resulted in the formation of the deposit are understood clearly enough so that reasonable subsurface interpretation can be made from surface exposures of the material and from drill hole data. Furthermore, it is assumed that there is an average of .065 short tons of sand and gravel per cubic foot (15.4 ft^3/ton).

In bedrock areas:

5) The basic geologic structures of the deposit must be understood clearly enough to make a reasonable interpretation of the lateral and vertical distribution of the material. Furthermore, it is assumed that there is an average of .070 short tons per cubic foot of material (14.5 ft^3/ton).

Resource Sectors

All extractable sand and gravel deposits suitable for aggregate within the Western Ventura County P-C Region have been divided into ten sectors (A-J) for the purpose of making resource calculations.

SECTOR A

Sector A encompasses 1,447 acres of land lying within the Santa Clara River channel sector. It extends from the United Water Conservation District's proposed diversion dam, located about 1¼ miles upstream from Los Angeles Avenue, to a point approximately 1 mile west of Highway 101 (Plate 3.1). The 6½ mile stretch of river is bordered on the south by a man-made levee and on the north by higher ground of an alluvial fan deposit along the base of the mountains to the north.

Drill hole records of several water wells located in Sector A indicate that sand and gravel extends from the surface downward to a depth of 30 to 130 feet. The deepest deposits occur along the southern margin and to the east. The northern margin of the river channel deposit appears to consist of overly fine-grained deposits of the adjacent alluvial fan at about 30 feet in depth.

A 20 percent waste factor is used for calculating the amount of total sand and gravel which can be used as various aggregate products (Portland cement concrete aggregate, asphaltic concrete aggregate, road base material, and railroad ballast). This factor is based on well-log evaluation, field investigation, including sampling by CDMG geologists, and company supplied information. However, deposits underlying Sector A have demonstrated a very high sand-to-gravel ratio, mainly because of the long distance from the rock sources and the low stream gradient to this depositional area. An overall average waste factor of 40 percent is used to calculate the amount of aggregate available for use in Portland cement concrete alone.

On this basis, it is estimated that a total of 240 million tons of aggregate underlies Sector A. Of this amount, 180 million tons of aggregate is suitable for use in Portland cement concrete (Table 3.3). These are classified as inferred resources and are in addition to reserves.

Two companies presently control property located within Sector A. However, recently instituted mining regulations limiting excavation to above the low-water flow line have severely restricted mining activity within those properties in the river channel.

SECTOR B

Sector B covers an area of 1,080 acres situated south of the river levee, north of Vineyard Avenue, and between Highway 101 and Los Angeles Avenue (Plate 3.1). The resource in Sector B extends from the surface to 130 feet in depth and possibly more in some places. A general depth of 130 feet below the surface is used in resource calculation because a thick clay layer is present at that depth in drill holes throughout the sector. The upper surface of the clay layer appears to be parallel or subparallel to the present day surface over most of the area of the section. Elevation in Sector B ranges from 125 feet above sea level at Los Angeles Avenue to about 75 feet above sea level at Highway 101.

As in Sector A, a 20 percent waste factor is used for calculating total aggregate resources. The waste factor is based on well-log evaluation, field investigation, including sampling done by CDMG geologists, and company supplied information. Also, as in Sector A, there is an abundance of sand in the deposits underlying Sector B. Therefore, a waste factor of 40 percent was assigned to these sand and gravel deposits for a second resource calculation to estimate the amount of material suitable for use in Portland cement concrete. The factor is based upon information from drill records and historical mining data.

Excluding company reserves and mined out areas, total inferred resources contained in Sector B to an average depth of 130

Table 3.3 Estimated aggregate resources of the Western Ventura County P-C Region. (Numbers shown in this table have been modified slightly from those shown in earlier drafts of this report.) (See Appendix C for definitions of terms used in this table.)

RESOURCES COVERED BY USE PERMIT *(Indicated Reserves)*			RESOURCES NOT COVERED BY USE PERMIT *(Inferred Resources)*												
RESOURCE DEPTH INTERVAL	REGULATED EXTRACTION LIMIT		RESOURCES CONTAINED BETWEEN SURFACE AND BOTTOM OF DEPOSIT		RESOURCES CONTAINED BETWEEN SURRACE AND 30' BELOW SURFACE		RESOURCES CONTAINED IN DEPTH INTERVAL BELOW 30' DEPTH		RESOURCES CONTAINED BETWEEN SURFACE AND 0 FEET ELEVATION (sea level)		RESOURCES CONTAINED IN DEPTH INTERVAL BELOW SEA LEVEL		RESOURCES CONTAINED IN TOTAL DEPTH INTERVAL		TOTAL RESOURCES
HIGHEST AGGREGATE USE**	PCC	MISC	PCC	MISC	PCC	MISC	PCC	MISC	PCC	MISC	PCC	MISC	PCC	MISC	PCC + MISC
SECTOR															
A	*	*	180	60									180	60	240
B	*	*							140	50	50	20	190	70	260
C									270	90	30	10	300	100	400
D			70	20									70	20	90
E	*	*			90	50	220	110					310	160	470
F					190	60	730	210					920	270	1190
G					160	20	480	60					640	80	720
H					120	20	830	100					950	120	1070
I					70	—	340	—					410	—	410
J					10	—	—	—					10	—	10
COLUMN TOTAL	30	10	250	80	640	150	2600	480	410	140	80	30	3980 ***	880 ****	4860

* Cannot be shown due to confidentality of producer data.

** Aggregate is divided into amount of material suitable for use in Portland Cement Concrete (PCC) and remaining material useable only in miscellaneous aggregate products (Misc) - asphaltic concrete, road base, and railroad ballast. Normally material suitable for use in Portland Cement Concrete is also used in miscellaneous aggregate products.

*** Includes 265 million tons located under producer properties.

**** Includes 100 million tons located under producer properties.

feet are estimated to be 260 million tons, 190 million tons of which are believed suitable for use in Portland cement concrete. Between ground surface and zero elevation (sea level), there are, exclusive of reserves and mined out areas, an estimated 190 million tons of aggregate material, 140 million tons of which are believed suitable for use in Portland cement concrete (Table 3.3).

SECTOR C

Sector C covers an area of 1,915 acres south of Vineyard Avenue extending from Los Angeles Avenue southwest to a point about 1 mile south of Highway 101 (Plate 3.1). Although a portion of land in Sector C is owned or leased by the aggregate industry, no permit to mine here has been granted.

Well log evaluation indicates that the depth of the sand and gravel deposit in Sector C ranges from 30 to 130 feet. As in Sector B, the top of a thick clay lens is recorded in many of the well logs at about 130 foot depth. Elevation of the surface in Sector C ranges from about 140 feet at the eastern margin to about 65 feet at the southern margin.

Waste factors used to calculate total aggregate resources and that portion of the resources suitable for use as Portland cement aggregate are the same as those for Sectors A and B (20 percent and 40 percent respectively).

An estimated 400 million tons of total resources, 300 million tons of which are believed suitable for use in Portland cement concrete, underly the area covered by Sector C. Of the 400 million tons, 360 million tons are calculated to lie between the surface and a maximum depth of 140 feet (sea level). 270 million tons of this is suitable for use in Portland cement concrete. These deposits are classified as inferred resources (Table 3.3). Forty million tons of aggregate are estimated to exist in the resource interval between sea level and the bottom of the deposit. Thirty million tons of this material is believed suitable for use in Portland cement concrete. This part of the deposit is also classified as inferred resources (Table 3.3).

SECTOR D

Sector D contains 390 acres occupied by the percolation basin east of Los Angeles Avenue (Plate 3.1). Depth to the bottom of the sand and gravel deposit in this sector, as recorded in well logs, ranges from 88 feet to 140 feet. An average depth of 120 feet was assigned to the deposit. As in Sectors A, B, and C, a waste factor of 20 percent was used to calculate total aggregate resources, while a 40 percent waste factor was used to calculate that portion of the deposit suitable for use in Portland cement concrete. A total of 90 million tons of aggregate, 70 million of which is suitable for Portland cement concrete aggregate, is calculated to lie beneath Sector D. This deposit is classified as an inferred resource (Table 3.3).

SECTOR E

Sector E encompasses 2,221 acres along and adjacent to the Santa Clara River and extending from the Ventura County Flood Control diversion structure northeast to the east boundary line of the land covered by Ventura County's Conditional Use Permit 3390 (Glacier Site), a distance of about 6 1/2 miles (Plate 3.1). Approximately 39 percent of the total area (872 acres) lies within the normal river channel while 61 percent (1,349 acres) lies on adjacent land.

For calculating aggregate resources, a 10 percent waste factor is assigned to the deposits underlying Sector E. This figure is lower than the 20 percent waste factor assigned to sectors to the west because there is a higher percentage of coarse material in these deposits. Thus, there is more coarse material available for road base and asphaltic concrete.

However, as with all sectors located below the Santa Paula Creek confluence, a waste factor of 40 percent is assigned to the deposits in order to estimate that portion of the material suitable for use as Portland cement concrete aggregate. This is because some of the coarse-grained rock clasts consist of unsuitable material (Monterey Shale). Based on well-log evaluation, depth of the deposit in Sector E ranges from a low of 36 feet along the north margin to a maximum of 160 feet in the mid region of the sector. An average resource depth of 90 feet was assigned to the entire length of the sector.

Two sets of resource figures are presented for Sector E, one for that portion of the deposit extending from the surface to 30 feet below the surface and the other for that portion of the deposit extending from 30 feet below the surface to the bottom of the resource interval. In the first depth interval (surface to 30 feet), there are an estimated 140 million tons of aggregate, 90 million tons of which are suitable for use in Portland cement concrete. In the lower depth interval, there are an estimated 330 million tons of aggregate, 220 million tons of which are suitable for use in Portland cement concrete. The combined total of each category is shown on Table 3.3. These deposits are placed in the inferred resource category.

SECTOR F

Sector F is composed of 3,348 acres of land within and adjacent to the Santa Clara River between the east boundary of the Glacier operation site (C.U.P. 3390) to the eastern margin of the confluence of Sespe Creek and the Santa Clara River at Sespe Street (Plate 3.1). Approximately 38 percent (1,258 acres) of the sector is within the Santa Clara River bed while 62 percent (2,090 acres) is on agricultural and other land outside of the river bed. No aggregate production is currently taking place in this sector.

Based on well-log examination, sand and gravel deposits contained in Sector F range in depth from 37 feet along the outer margins to 365 feet in the mid region of the sector. For resource calculation purposes, the sector was separated into four subsectors, and each was assigned an average resource depth figure based on well-log data. As in Sector E, a 10 percent waste factor was used for making resource calculations. However, a waste factor of 30 percent was assigned the deposits contained in Sector F to calculate the amount of material suitable for use in Portland cement concrete. This figure is lower than the counterpart 40 percent waste factor assigned Sectors A, B, C, D, and E because the deposits in Sector F are closer to the durable rock source in the San Gabriel Mountains (higher percentage of coarse material) and, since the confluence of the Santa Paula Creek and Santa Clara River is downstream from the sector, less undesirable rock material (Monterey Shale) has been contributed to the deposits.

Two sets of resource figures are presented for Sector F, one for that portion of the deposit extending from the surface to 30 feet

below the surface and the other for that portion of the deposit extending from 30 feet below the surface to the bottom of the resource interval. In the first depth interval (surface to 30 feet), there are an estimated 250 million tons of aggregate, 190 million tons of which are suitable for use in Portland cement concrete. In the lower depth interval, there are an estimated 940 million tons of aggregate, 730 million tons of which are suitable for use in Portland cement concrete. These deposits are categorized as inferred resources (Table 3.3).

SECTOR G

Sector G covers a total of 2,386 acres within an area extending from Sespe Avenue to Cavin Road (Plate 3.1). The sector consists of about 58 percent (1,395 acres) of river bed land and 42 percent (991 acres) of land located outside the river bed. Based on well-log evaluation, sand and gravel deposits contained in Sector B range in depth from 34 feet along the outer margins of the sector to 390 feet in the mid region of the sector. For resource calculation purposes, the sector was separated into four subsectors, and each was assigned an average resource depth based on well-log data. For calculating total aggregate resources, a 10 percent waste factor was used. However, the waste factor used for calculating the amount of material suitable for use in Portland cement concrete is 20 percent. This figure is lower than the counterpart waste-factor percentages for Sectors E and F because these deposits are closer to the durable rock sources in the San Gabriel Mountains (higher percentage of coarse material) and because the Santa Paula and Sespe Creeks have contributed less of the undesirable material (Monterey Shale) that is exposed within their drainage areas to the north to the Santa Clara River deposits in Sector G. However, because Piru Creek and several smaller streams transport the same undesirable material, also exposed within their drainage areas, a waste factor of 20 percent was assigned to the deposits.

Two sets of resource figures are presented for Sector G, one for that portion of the deposit extending from the surface to 30 feet below the surface and the other for that portion of the deposit extending from 30 feet below the surface to the bottom of the resource interval. In the first depth interval (surface to 30 feet), there are an estimated 180 million tons of aggregate, 160 million tons of which are suitable for use in Portland cement concrete. In the lower depth interval, there are an estimated 540 million tons of aggregate, 480 million tons of which are suitable for use in Portland cement concrete. These deposits are placed in the inferred resource category (Table 3.3).

SECTOR H

Sector H contains 1,827 acres along and adjacent to the Santa Clara River between Cavin Road on the west and at the east margin of the confluence of Piru Creek and Santa Clara River, a distance of 3.8 miles (Plate 3.1). Filfty-three percent (973 acres) of the area lies within the river bed of the Santa Clara River while 47 percent (854 acres) lies outside the river on mainly agricultural land. Based on well-log evaluation, sand and gravel deposits contained in Sector H range in depth from 74 feet along the outer margins to 515 feet in the mid region of the sector. For resource calculation purposes, the sector was divided into three subsectors, and each was assigned an average resource-depth figure based on well-log data. Deposits in Sector H are assigned waste factors of 10 percent for calculating total resources and 20 percent for calculating Portland cement concrete aggregate resources. The waste factors for Sector H deposits are the same as those for Sector G deposits because both sectors are situated between Piru Creek and Sespe Creek and are conditioned by the same depositional factors (see Sector G analysis).

Two resource figures are presented for Sector H, one for that portion of the deposit extending from the surface to 30 feet below the surface and the other for that portion of the deposit extending from 30 feet below the surface to the bottom of the resource interval. In the first depth interval (surface to 30 feet), there are an estimated 140 million tons of aggregate, 120 million tons of which are suitable to be Portland concrete aggregate. In the lower depth interval, there are an estimated 930 million tons of aggregate, 830 million tons of which are suitable for use in Portland cement concrete. These deposits are placed in the category of inferred resources (Table 3.3).

SECTOR I

Sector I covers an area of 983 acres along and adjacent to the Santa Clara River extending 2 1/2 miles east from the confluence of Piru Creek and the Santa Clara River to the gaging station shown on the U.S. Geological Survey quadrangle base map (Plate 3.1). Approximately 48 percent (468 acres) of the sector lies within the bed of the Santa Clara River, while 52 percent (515 acres) is composed of off-river lands. The few well logs available for Sector I record resource depths ranging from 31 feet near the outer margins of the sector to 318 feet in the mid region of the sector. An average depth of 184 feet was assigned for the resource interval.

Sector I is located upstream from the last of the significant streams draining areas to the north underlain by Monterey Shale and other undesirable material. Therefore, the introduction of unsuitable material into the deposit has not been as high as those deposits downstream. Also, the deposit is closer to the source of durable rock material in the San Gabriel Mountains. Consequently, a waste factor of 10 percent is assigned the deposits contained in Sector I. One hundred percent of the remaining portion of the deposit is believed to be suitable for use in Portland cement concrete. Two sets of resource figures are presented for Sector I, one for that portion of the deposit extending from the surface to 30 feet below the surface and the other for that portion of the deposit extending from 30 feet below the surface to the bottom of the resource interval. The two resource figures amount to 70 million tons and 340 million tons respectively, for a combined total of 410 million tons of aggregate. These deposits are placed in the category of inferred resources (Table 3.3).

SECTOR J

Sector J encompasses an area of about 216 acres between the gaging station, 2 1/2 miles east of the confluence of Piru Creek and Santa Clara River, and the Ventura-Los Angeles County line (Plate 3.1). Almost 100 percent of the area is within the channel of the Santa Clara River. No well data is available for Sector J, but it can be reasonably presumed that at least 30 feet of resources underlie the channel length of Sector J. These deposits have been assigned a waste factor of 10 percent for the same reasons discussed in Sector I. If the deposit extends to an average depth of 30 feet and contains about 10 percent in waste material, there are about 10 million tons contained in Sector J (Table 3.3). As in Sector I, 100 percent of the resources are believed to be suitable for use in Portland cement concrete.

ESTIMATED 50-YEAR CONSUMPTION OF AGGREGATE

The total projected consumption of aggregate in the Western Ventura County P-C Region for the next 50 years is estimated to be 310 million tons (Table 3.4). An additional 10 million tons of aggregate is expected to be exported to the south coast region of Santa Barbara County during the 50-year period. It is estimated that about 60 percent of the total amount, or approximately 190 million tons, will be used in the manufacture of Portland cement concrete.

Population and Aggregate Production Records

Population and aggregate production records were compiled for the years 1960-1978 for the Western Ventura County P-C Region (Figure 3.2). Records for the years prior to 1960 are in most cases incomplete. Records of population and aggregate production from 1960 to 1976 were also compiled for the adjacent P-C regions (Figures 3.3 and 3.4). Population projections to the year 2030 are presented in Figure 3.5.

Per Capita Consumption Rates

The Western Ventura County P-C Region averaged a per capita consumption rate of about 11.0 tons of aggregate per year between 1961 and 1977 (Figure 3.6). The per capita consumption rate was correlated with the population projections to determine aggregate consumption needs to the year 2030 (Table 3.4). Included in the calculations for the 50-year aggregate needs is a 200,000-tons-per-year export of sand and gravel into Santa Barbara County. The export figure is based on individual company sales records. The 200,000 tons per year is expected to continue unchanged in the future due to the no-growth policy of Santa Barbara County's south coast region. Similar estimates were made for the adjacent P-C regions (Figures 3.6 - 3.8).

POPULATION AND DWELLING UNIT DENSITIES

Population and dwelling unit densities of the Western Ventura County P-C Region and adjacent P-C regions are presented in Figures 3.9 and 3.10. The population and dwelling unit densities of the Western Ventura County, Simi, and Saugus-Newhall P-C regions are all relatively low compared to those of P-C regions in metropolitan Los Angeles (see corresponding section in Part II of this report). The relatively low population and dwelling unit densities of the Western Ventura County P-C Region suggest high urban growth potential in the coming years. Based on data obtained from the Ventura County Planning Department, the Southern California Association of Governments (1978), and the California State Department of Finance, population in the Western Ventura County P-C Region is expected to increase from about 340,000 in 1980 to over 750,000 in the year 2030, an increase of 120 percent. According to Ventura County (1978), the fastest growing cities in Ventura County are projected to be Thousand Oaks (89.9 percent increase by year 2000) and Oxnard (72.4 percent by year 2000). Within the unincorporated areas, Oak Park and Moorpark will absorb most of the new development. Generally, the greatest growth is expected to occur in the eastern parts of the county and in the larger cities. Except for Oak Park and Moorpark, virtually all future growth will occur within or adjacent to existing cities.

Table 3.4 Projected aggregate consumption (in million short tons) for the Western Ventura County, Simi, and Saugus-Newhall P-C regions.

	WESTERN VENTURA COUNTY P-C REGION		*SIMI P-C REGION*		*SAUGUS NEWHALL PC-REGION*	
	5 yr per capita consumption = 55 tons/person		*5 yr per capita consumption = 27.5 tons/person*		*5 yr per capita consumption = 29.3 tons/person*	
YEARS	*Average Population (millions)*	*Aggregate Consumption* (million tons)*	*Average Population (millions)*	*Aggregate Consumption (million tons)*	*Average Population (millions)*	*Aggregate Consumption (million tons)*
1980-1985	0.36**	21	0.34	9	.080	5
1985-1990	0.40	23	0.37	10	.087	5
1990-1995	0.44	25	0.41	11	.092	6
1995-2000	0.48	27	0.44	12	.095	6
2000-2005	0.52	30	0.47	13	.098	6
2005-2010	0.57	32	0.51	14	.104	6
2010-2015	0.61	35	0.54	15	.110	7
2015-2020	0.65	37	0.57	16	.117	7
2020-2025	0.70	40	0.60	17	.122	8
2025-2030	0.73	41	0.63	17	.127	8
TOTAL		310 (190)***		130 (80)		60 (40)

*Aggregate Consumption = population (5 years average) x 5 year per capita consumption. (Western Ventura County aggregate consumption includes an every five year export of one million tons to Santa Barbara County: for example, for the 1980-1985 period, (.36)(55) = 20 million tons + 1 million tons = 21 million tons.)

**Population projections based on data from Ventura County, the State Department of Finance (1977), and the Southern California Association of Governments (1978).

***Approximately 60% of the total aggregate demand will be for Portland cement concrete.

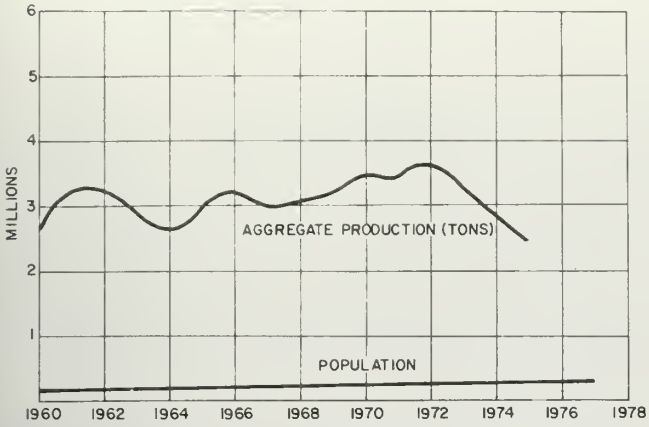


Figure 3.2 Western Ventura Caunty P-C Region: papulation ond oggregate productian record for years 1960-1977.

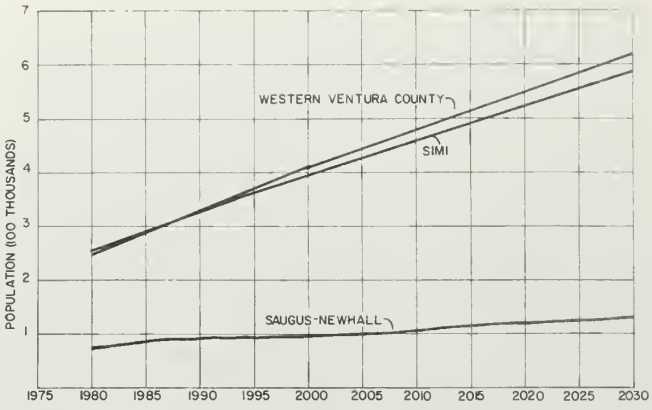


Figure 3.5 Projected papulatians of the Western Venturo County, Simi, and Sougus-Newholl P-C regians ta the year 2030.

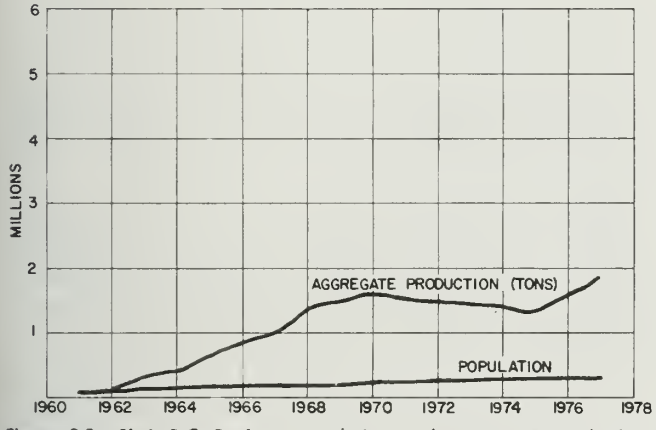


Figure 3.3 Simi P-C Region: populotion and aggregote production records for years 1960-1976.

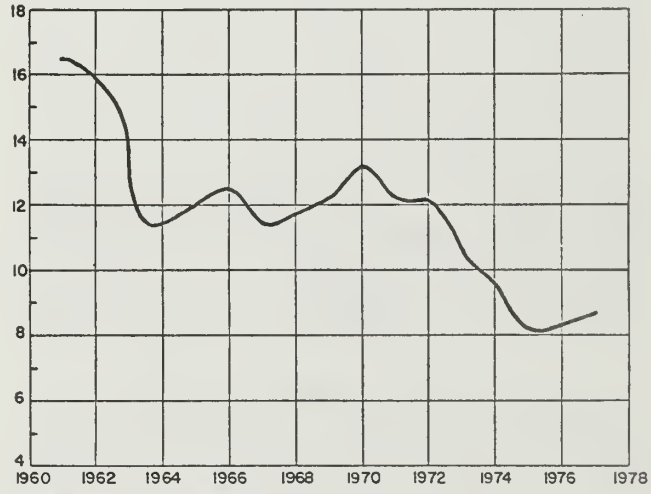


Figure 3.6 Annual per copito cansumption in the Western Venturo Caunty P-C Regian far years 1961-1977.

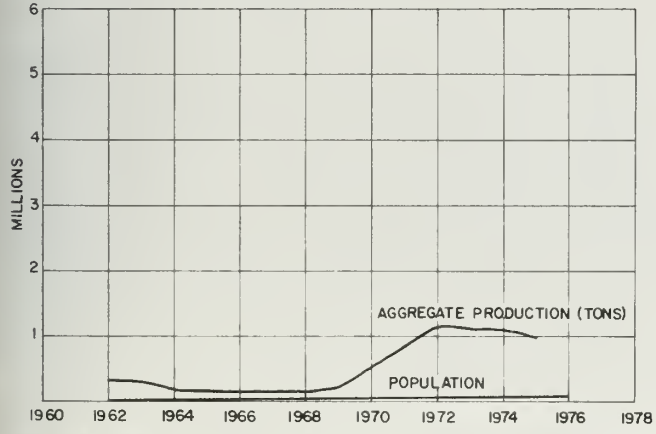


Figure 3.4 Sougus-Newhall P-C Region: papulatian and aggregate praductian records for years 1960-1976.

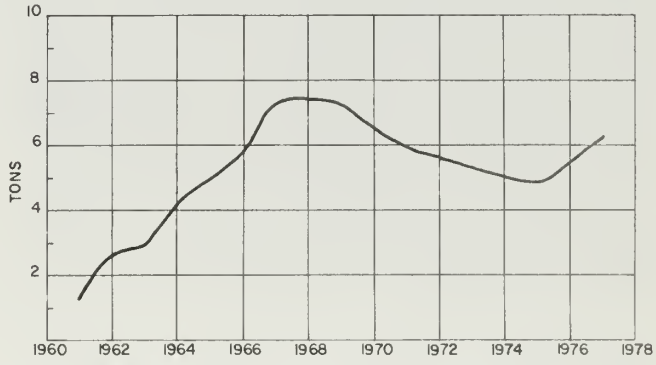


Figure 3.7 Annuol per capito consumption in the Simi P-C Region for yeors 1961-1977.

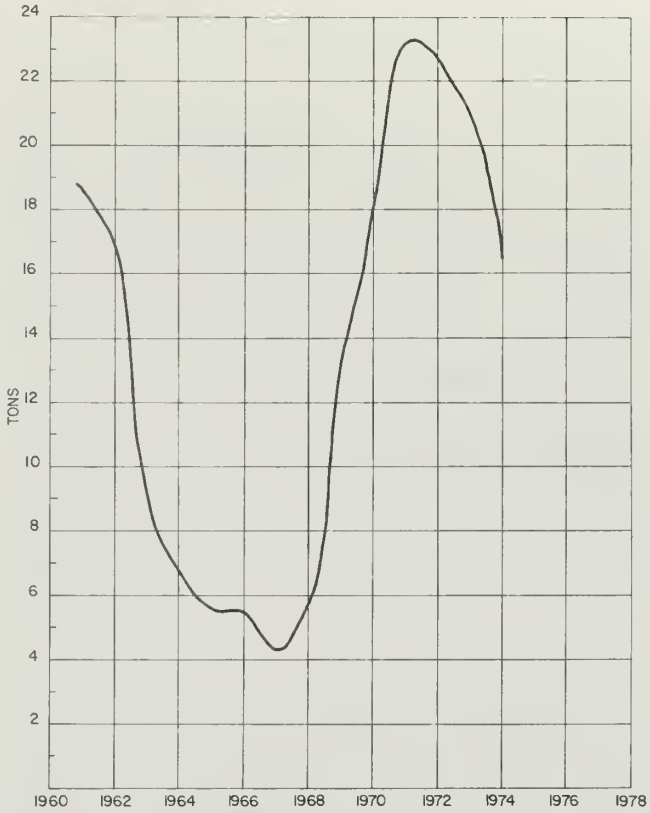


Figure 3.8 Annual per copito consumptian af oggregate in the Sougus-Newhall P-C Region far years 1961-1974.

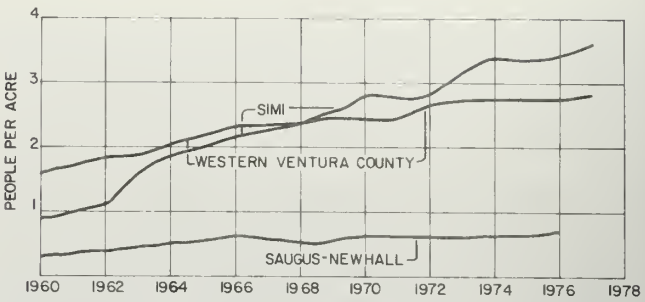


Figure 3.9 Camporison of populotion densities far Western Ventura Caunty, Simi, ond Sougus-Newhall P-C regions for years 1960-1976.

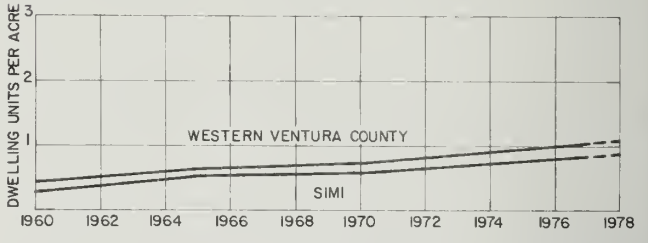


Figure 3.10 Camparison of dwelling unit densities far the Western Ventura County and Simi P-C regians far yeors 1960-1976. (Doto unavoilable far the Sougus-Newholl P-C Regian.

FACTORS AFFECTING PER CAPITA CONSUMPTION RATES

Per capita consumption of aggregate has varied with time and is different in each P-C region (Figures 3.6-3.8). Factors such as changes in urban growth with time, relative degrees of urban maturity, and major construction projects (for example, freeways) could account for the variations and differences.

Figure 3.6 shows a general decrease in per capita consumption of aggregate in the Western Ventura County P-C Region between 1961 and 1977. However, there is a remarkable consistency in annual per capita consumption between the years 1964 and 1972, ranging between 10.6 and 11.6 tons per person per year. This can be explained by the fact that population increases in the Western Ventura County P-C Region amounted to only 27 percent during that 9-year period. This is compared to the 112 percent population increase in the Simi P-C Region between 1961 and 1968 when per capita consumption rates there were steadily increasing each year until population growth rates began to level off (Figure 3.7). Population growth rates in the Western Ventura County P-C Region declined even more after 1972, amounting to about 1,000 persons a year between 1972 and 1975. As an apparent consequence, annual per capita consumption rates fell to 7.4 tons by 1975 (Figure 3.6). However, the annual population increase jumped to about 4,000 persons per year in 1976 and 1977 (Figure 3.2), and per capita consumption also showed a renewed upward trend.

The above discussion points out the general relation that exists between population rates and the consumption of aggregate. On the basis of that relation, it is possible to forecast the total amount of aggregate that will be required to fill the needs of a particular consumption area within a specified time interval if projected per capita consumption rates are related to population growth rates for each year during the time interval. However, it is very difficult to forecast variances in annual growth rates and accompanying changes in per capita consumption rates into the future. Population projections are normally calculated on the basis of relatively steady growth rates which will have the effect of averaging out the future variances in the annual population increases. Accordingly, total aggregate needs of the Western Ventura Counlty P-C Region to the year 2030 were calculated on the basis of three factors: (1) a projected annual per capita aggregate consumption rate of 11.0 tons; (2) an annual aggregate export of 200,000 tons into Santa Barbara County; and (3) the projected population growth for the region over the 50-year period. The results of these calculations are presented on Table 3.4.

The average Western Ventura County P-C Region per capita consumption rate of 11.0 is believed valid for forecasting future needs unless unforeseen events occur, such as massive urban renewal or disaster reconstruction. The average per capita consumption rate over the next 50-year period in the Western Ventura County P-C Region could increase as much as 100 percent as a result of extensive earthquake damage or other unforeseen circumstances that would necessitate massive reconstruction. Such events would result in a sharp increase in per capita consumption of aggregate during the period of active reconstruction. The amount of aggregate needed in addition to the steady state consumption of 11.0 tons per person per year would depend upon the extent and duration of reconstruction. Per capita consumption would probably then gradually return to an annual rate equivalent to that which existed before reconstruction began.

ALTERNATIVE SOURCES OF AGGREGATE

Introduction

Potential sources of aggregate, in addition to the alluvial sand and gravel deposits classified in this report as MRZ-2, occur within and near the Western Ventura County P-C Region. These sources include resources in adjacent P-C regions, areas underlain by Tertiary-aged sedimentary rocks, crystalline volcanic rocks, Quaternary-aged alluvium and fan deposits, and offshore sand and gravel deposits.

Except for the resources in adjacent P-C regions, too little is known about the physical and chemical rock qualities (see Part I, "Overview of Aggregate") of alternative sources of aggregate to permit even crude resource estimates. However, a general discussion about the potential resources, their occurrence, and factors controlling their utilization is presented in the following section.

Sand and Gravel Resources of Adjacent P-C Regions

RESOURCE ESTIMATES

The resource estimate given in this report for one of the two P-C regions adjacent to the Western Ventura County P-C region, the Saugus-Newhall P-C region, was derived from data taken from California Division of Mines and Geology Special Report 139 (Evans and others, 1979). The reserve estimate is current to January 1979. The resource estimate was made using published geologic maps with reconnaisance field checking, including visits to sand and gravel plants operating in 1978. The following parameters were assumed in estimating the resource:

1) Material density ranges from .060 to .065 short tons per cubic foot.
2) Waste does not exceed 25 percent.
3) Technology is presently available for economic extraction.
4) Estimates were limited to areas which are not urbanized and for which mining is still a possible interim land use.
5) In bedrock areas, the lowest level of extraction would be such to permit drainage of the quarried area.

The resource figures for the Simi P-C Region are taken from Part II of this report. The estimated resources of adjacent P-C regions are presented on Table 3.5.

Localities marked as PRZ (Preliminary Resource Zone) on Plate 2.1 contain all of the known tentative MRZ-2 resource areas in the Saugus-Newhall P-C region. Changes in both the resource estimation and the outlines of the zones will most likely be made when a more detailed study is done.

ESTIMATED 50-YEAR CONSUMPTION OF AGGREGATE IN ADJACENT P-C REGIONS

Estimated 50-year aggregate needs for adjacent P-C regions are presented on Table 3.4. Comparison of Tables 3.4 and 3.5 shows that the projected 50-year total consumption of aggregate for each of the two adjacent P-C regions is less than their respective total reserve estimates. However, the estimated reserves for the Simi P-C Region are marginally sufficient to supply its 50-year projected needs for aggregate. Therefore, if none of the presently *non-permitted resources* in the Simi P-C Region are permitted as additional *reserves,* any significant export of the present *reserves* into the Western Ventura County P-C Region will result in a short fall in the Simi P-C Region over the next 50 years.

The present producers located in adjacent P-C regions are the most immediate alternative sources of known quality construction aggregate. The drawbacks of depending heavily on those sources in the future are the increased haulage costs, added air pollution caused by the increased truck travel, and the lack of control on those sources by the market population of the Western Ventura County P-C Region. This last drawback is amplified by the fact that the adjacent Simi P-C Region has just enough reserves to meet its projected needs for the next 50 years. And, although the Saugus-Newhall P-C Region may appear to have an oversupply, it is in Los Angeles County, and decisions made concerning future availability of aggregate resources in that area may not take into account the interests of the western Ventura County market.

Sedimentary Rocks as Alternative

Clastic sedimentary deposits of Cenozoic age crop out over much of the Western Ventura County P-C Region in the hilly and mountainous areas. Many of these deposits are probably unsuitable for aggregate material because they are fine-grained (siltstones and shales) or they lack a coarse gravel-sized fraction (for example, sandstones). Not enough is known about these units to exclude all of them from possibly having some part that would be suitable for aggregate use in the future. Therefore, several of the sedimentary formations that are recorded as having sandstone and possibly coarser beds are classified as MRZ-3.

Table 3.5 Aggregate resources of the Western Ventura County, Simi, and Saugus-Newhall P-C regions.

PRODUCTION-CONSUMPTION REGION	*RESERVES (Million Tons)*	*RESOURCES (Million Tons)*	*TOTAL (Million Tons)*
Western Ventura County	40	4900*	4900*
Simi	170	1000	1200*
Saugus-Newhall	200	230	430
CATEGORY TOTAL	400*	6100*	
TOTAL RESERVES-RESOURCES, Simi, Western Ventura County, San Fernando Valley and Saugus-Newhall:			6500*

*Figure rounded off to the nearest 100 million tons.

A few of these Cenozoic deposits, although predominantly sandstone, contain local areas that are known to have varying amounts of gravel, and although these units are also classified as MRZ-3, they are much more favorable and are deserving of further attention. As yet, none of these units have been mined for aggregate within the lower Santa Clara River-Ventura River production district (see Figure 1.3); however, some of those discussed below have been mined in nearby areas.

The youngest three of the Tertiary units—the Santa Barbara, Saugus, and San Pedro Formations—are, in part, lateral equivalents of one another. Geologic mapping has in some places separated these units and, in others, it has not. These units are extensively exposed on the south flank of the hills north of the Santa Clara River, from the City of Ventura to Fillmore. For the most part, these formations in this area are predominantly siltstones and sandstones, but coarser lenses contain curable cobbles. Material in the Saugus Formation is presently mined for aggregate in several areas in Oak Ridge, north of Simi and Moorpark, but these operations produce large amounts of sand waste and probably survive due to their proximity to a market area. Further detailed study of the Santa Barbara, Saugus, and San Pedro Formations exposed within Western Ventura County P-C Region would be necessary to determine their future potential as an aggregate source.

The Casitas Formation is also a possible stratigraphic equivalent of part of the San Pedro Formation. It is exposed near the far west edge of Ventura County along Rincon Creek. The Casitas Formation is composed of unsorted gravel, sand, and silt, and is relatively unconsolidated. This is one of the most promising of the bedrock sediment deposits classified as MRZ-3, but it may well find a market in the Carpenteria area to the west outside of the Western Ventura County P-C Region.

The Sespe Formation also holds some promise as a future sources of aggregate material. Although the Sespe Formation commonly contains a relative abundance of deleterious material, it does have local beds of relatively clean sandstone and conglomerate with durable, well-rounded clasts of volcanic rock, granitic rock, and minor shale and metamorphic rock. A large conglomerate lens within the Sespe Formation is mined for aggregate in Orange County along the Santa Ana River. Further studies would be needed to locate and assess the most favorable areas in the Sespe Formation within the Western Ventura County P-C Region.

A long range alternative might be the bedrock sedimentary units, although much testing and evaluation would need to be done to discover marketable sources. The pluses are that the upland areas underlain by these sediments are not likely to experience urban development pressure in the near future, operations would probably have a low visual impact, and their locations within the P-C region would provide for reasonable haulage distances and local control.

Quaternary Alluvial Deposits as Alternative

In the Western Ventura County P-C Region, all the known sand and gravel resources that have been compiled for this report are in the alluvial areas along the Santa Clara River and the Ventura River. Near the margins of these areas that have been classified as MRZ-2, there are adjacent areas classified as MRZ-3. These MRZ-3 areas are discussed as alternative sources.

A large tract of alluvial material between the south-westernmost MRZ-2 boundary along the Santa Clara River and the coast may be a potential source of aggregate. The well-log data shows a relatively high percentage of fines in this area as compared to similar areas farther upstream. Some lenses in this deposit may be suitable for use as aggregate, but detailed information will be necessary to delineate them.

South of the present Santa Clara River course on the Oxnard Plain is an older, buried river channel that may contain minable deposits of aggregate. The general course of this old channel is fairly straight and extends from near the western end of South Mountain where it diverges from the present channel, in Port Hueneme. The channel ranges from a half mile to a mile wide, narrowing seaward, and is buried by about 5 feet of overburden.

Any future mining in either of these areas would be confronted with the same permit restrictions as those of the present aggregate operations; in addition, the area near the mouth of the Santa Clara River is of great environmental concern as a coastal wildlife habitat and as a beach sediment recharge avenue. The older buried channel lies mostly in urban areas and would be a potential suitable source of aggregate only near its northern end.

Another deposit adjacent to the MRZ-2 area along the Santa Clara River lies west of the town of Fillmore. This deposit is not river-laid alluvium, but is derived from the slopes and canyons to the northwest on the flank of Santa Paula Peak. The area delineated by drill log data is about 4 1/2 miles long and a mile wide, extending along both sides of the Southern Pacific Railway from Kenny Grove halfway to Santa Paula. The data indicates a high percentage of coarse material here, but the quality is unknown.

The alluvial sediments in the Ventura River Canyon and its larger tributaries are possible alternative sources of aggregate material. Although the Southern Pacific Milling Company is presently mining aggregate in the Ventura River, the products are base and fill, reflecting the low quality of the deposit. The clasts are predominately sandstone with minor amounts of shale and chert. This would be generally unsuitable for Portland cement concrete aggregate; however, tributaries may carry higher quality material into local parts of the drainage. The data are not detailed enough to delineate any such areas at present.

At the east end of Ojai Valley, the large alluvial fan originating from Horn Canyon consists of boulders and sand. Although drill hole data shows this large deposit to be generally uniform in coarse material, the quality of the clasts is not known. As Horn Canyon drains an area underlain by sandstone and siltstone bedrock formations, it is unlikely that this material would be suitable as Portland cement concrete aggregate.

The conversion of any of the Quaternary alluvial or fan sediments classified as MRZ-3 into future alternative sources of construction aggregate is doubtful. The development of alternative deposits located in the Santa Clara River channel or Oxnard Plain would share the same environmental difficulties that the present sand and gravel production areas have with probable higher attendant costs due to lower source quality. The other deposits in Ventura River Canyon, Ojai Valley, and the Fillmore area most likely will not yield aggregate of Portland cement concrete quality, and will probably find their highest use as base material or fill. And, although a continued production of those products from sources such as the Ventura River is important,

the need for future sources of Portland cement concrete aggregate is more pressing.

Sources of Crushed Rock as Alternative

The only available nearby source of rock suitable for crushing and processing into aggregate material is in the Tertiary volcanic rocks that are exposed over large areas of the western and central Santa Monica Mountains (Conejo Volcanics of middle Miocene age), most of which are within the Western Ventura County P-C Region and have been classified as MRZ-3 (Plates 1.21, 1.22, 1.23, 1.24, 2.1, and 2.3). Some of these volcanic rocks might be crushed and processed into aggregate material if the rock is of acceptable quality.

These volcanic rocks have not been thoroughly evaluated for use as aggregate material; however, cursory field examination and petrographic analysis of several rock samples indicate that rocks in this area have undergone widespread zeolitization. Volcanic rocks with high zeolite content are potentially reactive in concrete and, therefore, unsuitable for use as aggregate. Deuteric rock alterations also could degrade the durability of the material. Exploration and testing is necessary to delineate any suitable crushed rock resource areas in this terrane.

LAND-USE FACTORS

Most of the volcanic rock exposed in the Santa Monica Mountains lies within the proposed boundaries of the Santa Monica Mountains National Recreation Area (NRA), established November 10, 1978, with passage of Public Law 95-625, Section 507 (Plate 1.1). The NRA is administered by the U.S. Department of the Interior through the National Park Service. Public Law 95-625 mandates that "The Secretary shall manage the recreation area in a manner which will preserve and enhance its scenic, natural and historical setting and its public health value as an airshed for the southern California metropolitan area while providing for the recreational and educational needs of the visiting public." Although the enabling legislation does not address mining activity specifically, Section 507(i) states: "In the administration of the recreation area, the Secretary may utilize such statutory authority available for the conservation and management of wildlife and natural resources as appropriate to carry out the purpose of this section. The fragile resource areas of the recreation area shall be administered on a low-intensity basis, as determined by the Secretary." Opportunities for future mining activity in this area seem uncertain at best.

ENVIRONMENTAL FACTORS

Major environmental factors that must be addressed when evaluating mining and processing of crushed rock for aggregate material are water and air quality, operational noise level, reclamation of mined land, and esthetics. The aggregate industry must meet rigorous city, county, state, and federal requirements to abate and mitigate degradation of the environment. Specific environmental concerns can vary from one locality to another depending on the nature of the surrounding environment. For instance, environmental issues regarding crushed rock aggregate operations in the western Simi Valley-Newbury Park area that might be raised by the people in the surrounding residential sections would be related to dust, noise (blasting), and truck traffic resulting from plant operations. In unpopulated, undeveloped areas of the Santa Monica Mountains, esthetic quality, noise, water pollution, and disturbance of surrounding biota might receive greatest concern.

Offshore Sediment Deposits as Alternative

Although there are no known gravel deposits in the near-shore environment along the Ventura County coast, there are some scattered deposits at shallow depths adjacent to the Santa Barbara Islands. Neither the quantity nor quality of these deposits has been assessed.

The number of requirements that would have to be met in order to mine any offshore deposits seems to be prohibitive. The environmental factors concerning damage to marine life would probably be one of the most difficult to overcome. Nevertheless, such deposits might be considered as potential alternative sources of aggregate for the Western Ventura County P-C Region.

The development of the gravel deposits offshore of the Santa Barbara Islands presents a totally different and perhaps even more difficult set of environmental problems. Even if the feasibility of tapping these deposits were proven, there would probably be a protracted period of development necessary for what appears to be a limited supply.

Aggregate Replenishment in the Santa Clara River

Hypothetically, aggregate replenishment from the drainage of the Santa Clara River can, in the future, contribute aggregate to restore some of the volume of mined material in Ventura County. Unfortunately, this issue is impossible to address quantitatively without an extensive data base on the fluvial history of the river, and even then conclusions might be quite speculative. We have not located any quantitative studies concerning the rate of replenishment on the river or any other fluvial regime which would permit analysis of this topic.

Given the erratic pattern and infrequency of storms large enough to transport a significant bed load (volume of material and replenishment rate) and the varied geologic nature of the watershed (material quality and chemical reactivity), we conclude that replenishment cannot be relied upon as a dependable source to budget against projected shortfalls.

CONCLUSIONS AND RECOMMENDATIONS

The Western Ventura County P-C Region will require approximately 310 million tons of aggregate for construction over the next 50 years based on an anticipated annual per capita consumption rate of 11.0 tons and an annual export of 200,000 tons into Santa Barbara County. Sixty percent of this requirement, or about 190 million tons, will have to be suitable for Portland cement concrete aggregate.

Current reserves of material (including aggregate used in Portland cement concrete, asphaltic concrete, and road base) are approximately 40 million tons (30 million tons for Portland cement concrete). These reserves will be depleted in about 13 years based on the present average rate of consumption. Possible ways of meeting local aggregate requirements after these reserves are exhausted include: (1) extending the operating life of existing operations by allowing mining on adjacent lands or extraction of resources available beneath the permitted depth of

mining; (2) opening new operations elsewhere; and/or (3) importing aggregate from adjacent production districts.

Each of the alternative actions above has a price-tag attached to it, either in monetary terms, environmental terms, or both. Extending the life of existing aggregate operations would necessitate extracting material over larger surface areas and/or from depths greater than currently permitted. Such a course would require a careful, case-by-case assessment of environmental consequences.

Production of aggregate from any other site within the Western Ventura County P-C Region would involve shifting production either to a bedrock source or, alternatively, to some other locality within the Santa Clara River system. The current study has not uncovered any nearby bedrock sources within the Western Ventura County P-C Region that would clearly serve as a supply of concrete aggregate. Considerable geologic study, subsurface exploration, and sampling and testing would be necessary to identify such material.

Further to the east from where current aggregate plants are located, there are large sources of aggregate within the Santa Clara River system that could probably be developed. Opening up new mine areas in those localites would still necessitate a careful assessment of the environmental consequences. This course of action would also probably have a measureable effect on the FOB price of aggregate to the public because of the large capital investment involved in erecting new processing facilities and opening up new ground for extraction. Increased haulage costs, public safety problems involved with increased haulage distances, accelerated road deterioration, additional air pollution, and increased consumption of scarce fuel would be direct new impacts of shifting to upstream locations within the Santa Clara River basin.

Importing materials from another production district would eliminate some of the environmental problems related to opening up new ground within the Santa Clara River basin, but it would increase the severity of all of the other problems discussed above.

Currently there are 30 million tons of reserves of aggregate suitable for use in Portland cement concrete. The anticipated 50-year requirement for aggregate suitable for this use is 190 million tons. A shortfall for the 50-year period of 160 million tons is therefore projected. This projected shortfall of reserves suggests that it may be in the public interest for lead agencies within the region to take measures to ensure the availability of currently non-permitted resources within the region for future use.

Findings of this study indicate that all 10 sections (A-J) within the Western Ventura County P-C Region contain aggregate resources of regional significance. Because these resources are needed to ensure that the Western Ventura County P-C Region will have an adequate supply of aggregate to meet its 50-year requirement, the CDMG staff recommends that the State Mining and Geology Board consider for designation the areas classified MRZ-2 within Sectors A-J.

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APPENDIX A–1

Surface Mining and Reclamation Act of 1975

CALIFORNIA DIVISION OF MINES AND GEOLOGY
1416 Ninth Street Room 1341 Sacramento CA 95814 Phone: 916 445-0514

CDMG NOTE 50

SURFACE MINING AND RECLAMATION ACT OF 1975

Article 1. General Provisions

2710. This chapter shall be known and may be cited as the Surface Mining and Reclamation Act of 1975.

2711. (a) The Legislature hereby finds and declares that the extraction of minerals is essential to the continued economic well-being of the state and to the needs of the society, and that the reclamation of mined lands is necessary to prevent or minimize adverse effects on the environment and to protect the public health and safety.

(b) The Legislature further finds that the reclamation of mined lands as provided in this chapter will permit the continued mining of minerals and will provide for the protection and subsequent beneficial use of the mined and reclaimed land.

(c) The Legislature further finds that surface mining takes place in diverse areas where the geologic, topographic, climatic, biological, and social conditions are significantly different and that reclamation operations and the specifications therefor may vary accordingly.

2712. It is the intent of the Legislature to create and maintain an effective and comprehensive surface mining and reclamation policy with regulation of surface mining operations so as to assure that:

(a) Adverse environmental effects are prevented or minimized and that mined lands are reclaimed to a usable condition which is readily adaptable for alternative land uses.

(b) The production and conservation of minerals are encouraged, while giving consideration to values relating to recreation, watershed, wildlife, range and forage, and aesthetic enjoyment.

(c) Residual hazards to the public health and safety are eliminated.

2713. It is not the intent of the Legislature by the enactment of this chapter to take private property for public use without payment of just compensation in violation of the California and United States Constitutions.

2714. The provisions of this chapter shall not apply to any of the following activities:

(a) Excavations or grading conducted for farming or onsite construction or for the purpose of restoring land following a flood or natural disaster.

(b) Prospecting for, or the extraction of, minerals for commercial purposes and the removal of overburden in total amounts of less than 1,000 cubic yards in any one location of one acre or less.

(c) Surface mining operations that are required by federal law in order to protect a mining claim, if such operations are conducted solely for that purpose.

(d) Such other surface mining operations which the board determines to be of an infrequent nature and which involve only minor surface disturbances.

2715. No provision of this chapter or any ruling, requirement, or policy of the board is a limitation on any of the following:

(a) On the police power of any city or county or on the power of any city or county to declare, prohibit, and abate nuisances.

(b) On the power of the Attorney General, at the request of the board, or upon his own motion, to bring an action in the name of the people of the State of California to enjoin any pollution or nuisance.

(c) On the power of any state agency in the enforcement or administration of any provision of law which it is specifically authorized or required to enforce or administer.

(d) On the right of any person to maintain at any time any appropriate action for relief against any private nuisance as defined in Part 3 (commencing with Section 3479) of Division 4 of the Civil Code or for any other private relief.

(e) On the power of any city or county to adopt policies, standards, or regulations imposing additional requirements on any person if the requirements do not prevent the person from complying with the provisions of this chapter.

(f) On the power of any city or county to regulate the use of buildings, structures, and land as between industry, business, residents, open space (including agriculture, recreation, the enjoyment of scenic beauty, and the use of natural resources), and other purposes.

2716. Any person may commence an action on his own behalf against the board or the State Geologist for a writ of mandate pursuant to Chapter 2 (commencing with Section 1084) of Title 1 of Part 3 of the Code of Civil Procedure to compel the board or the State Geologist to carry out any duty imposed upon them pursuant to the provisions of this chapter.

2717. The board shall submit to the Legislature on December 1st of each year a report on the actions taken pursuant to this chapter during the preceding fiscal year. Such report shall include a statement of the actions, including legislative recommendations, which are necessary to carry out more completely the purposes and requirements of this chapter.

2718. If any provision of this chapter or the application thereof to any person or circumstance is held invalid, such invalidity shall not affect other provisions or applications of the chapter which can be given effect without the invalid provision or application, and to this end the provisions of this chapter are severable.

Article 2. Definitions

2725. Unless the context otherwise requires, the definitions set forth in this article shall govern the construction of this chapter.

2726. "Area of regional significance" means an area designated by the board pursuant to Section 2790 which is known to contain a deposit of minerals, the extraction of which is judged to be of prime importance in meeting future needs for minerals in a particular region of the state within which the minerals are located and which, if prematurely developed for alternate incompatible land uses, could result in the permanent loss of minerals that are of more than local significance.

For a list of geologic maps and reports available from the California Division of Mines and Geology, write to the California Division of Mines and Geology, P.O. Box 2980, Sacramento, CA 95812, or visit our District offices in SACRAMENTO, Room 118, 1416 Ninth Street; SAN FRANCISCO, Room 2022, Ferry Building; LOS ANGELES, Room 1065, 107 South Broadway.

2727. "Area of statewide significance" means an area designated by the board pursuant to Section 2790 which is known to contain a deposit of minerals, the extraction of which is judged to be of prime importance in meeting future needs for minerals in the state and which, if prematurely developed for alternate incompatible land uses, could result in the permanent loss of minerals that are of more than local or regional significance.

2728. "Lead agency" means the city or county which has the principal responsibility for approving a surface mining operation pursuant to this chapter.

2729. "Mined lands" includes the surface, subsurface, and ground water of an area in which surface mining operations will be, are being, or have been conducted, including private ways and roads appurtenant to any such area, land excavations, workings, mining waste, and areas in which structures, facilities, equipment, machines, tools, or other materials or property which result from, or are used in, surface mining operations are located.

2730. "Mining waste" includes the residual of soil, rock, mineral, liquid, vegetation, equipment, machines, tools, or other materials or property directly resulting from, or displaced by, surface mining operations.

2731. "Operator" means any person who is engaged in surface mining operations, himself, or who contracts with others to conduct operations on his behalf, except a person who is engaged in surface mining operations as an employee with wages as his sole compensation.

2732. "Overburden" means soil, rock, or other materials that lie above a natural mineral deposit or in between mineral deposits, before or after their removal by surface mining operations.

2732.5. "Permit" means any authorization from, or approval by, a lead agency, the absence of which would preclude surface mining operations.

2733. "Reclamation" means the combined process of land treatment that minimizes water degradation, air pollution, damage to aquatic or wildlife habitat, flooding, erosion, and other adverse effects from surface mining operations, including adverse surface effects incidental to underground mines, so that mined lands are reclaimed to a usable condition which is readily adaptable for alternate land uses and create no danger to public health or safety. The process may extend to affected lands surrounding mined lands, and may require backfilling, grading, resoiling, revegetation, soil compaction, stabilization, or other measures.

2734. "State policy" means the state policy for the reclamation of mined lands adopted pursuant to Section 2755.

2735. "Surface mining operations" means all, or any part of, the process involved in the mining of minerals on mined lands by removing overburden and mining directly from the mineral deposits, open-pit mining of minerals naturally exposed, mining by the auger method, dredging and quarrying, or surface work incident to an underground mine. Surface mining operations shall include, but are not limited to:

(a) Inplace distillation or retorting or leaching.

(b) The production and disposal of mining waste.

(c) Prospecting and exploratory activities.

Article 3. District Committees

2740. In carrying out the provisions of this chapter, the board may establish districts and appoint one or more district technical advisory committees to advise the board. In establishing districts for these committees, the board shall take into account physical characteristics, including, but not limited to, climate, topography, geology, type of overburden, and principal mineral commodities. Members of the committees shall be selected and appointed on the basis of their professional qualifications and training in mineral resource conservation, development and utilization, land use planning, mineral economics, or the reclamation of mined lands.

2741. The members of the committee shall receive no compensation for their services, but shall be entitled to their actual and necessary expenses incurred in the performance of their duties.

Article 4. State Policy for the Reclamation of Mined Lands

2755. On or before January 1, 1977, the board shall adopt state policy for the reclamation of mined lands in accordance with the general provisions set forth in Article 1 (commencing with Section 2710) of this chapter and pursuant to Chapter 4.5 (commencing with Section 11371) of Part 1 of Division 3 of Title 2 of the Government Code.

2756. State policy shall apply to the conduct of surface mining operations and shall include, but shall not be limited to, measures to be employed by local governments in specifying grading, backfilling, resoiling, revegetation, soil compaction, and other reclamation requirements, and for soil erosion control, water quality and watershed control, waste disposal, and flood control.

2757. The state policy adopted by the board shall be based upon a study of the factors that significantly affect the present and future condition of mined lands, and shall be used as standards by local governments in preparing specific and general plans, including the conservation and land use elements of the general plan, and zoning ordinances. The state policy shall not include aspects of regulating surface mining operations which are solely of local concern, and not of statewide or regional concern, as determined by the board, such as, but not limited to, hours of operation, noise, dust, fencing, and purely aesthetic considerations.

2758. Such policy shall include objectives and criteria for all of the following:

(a) Determining the lead agency pursuant to the provisions of Section 2771.

(b) The orderly evaluation of reclamation plans.

(c) Determining the circumstances, if any, under which the approval of a proposed surface mining operation by a lead agency need not be conditioned on a guarantee assuring reclamation of the mined lands.

2759. The state policy shall be continuously reviewed and may be revised. During the formulation or revision of such policy, the board shall consult with, and carefully evaluate the recommendations of, the State Geologist, any district technical advisory committees, concerned federal, state, and local agencies, educational institutions, civic and public interest organizations, and private organizations and individuals.

2760. The board shall not adopt or revise the state policy unless a public hearing is first held respecting their adoption or revision. At least 30 days prior to such hearing, the board shall give notice of the hearing by publication pursuant to Section 6061 of the Government Code.

2761. (a) On or before January 1, 1977, and, as a minimum, after the completion of each decennial census, the Office of Planning and Research shall identify urban and urbanizing portions of the following areas within the state subject to urban expansion or other irreversible land uses:

(1) Standard metropolitan statistical areas and such other areas for which information is readily available.

(2) Other areas as may be requested from time to time by the board.

(b)In accordance with a time schedule, and based upon guidelines adopted by the board, the State Geologist shall classify, on the basis solely of geologic factors, and without regard to existing land use and land ownership, the areas identified by the Office of Planning and Research, and such other areas as may be specified by the board, as one of the following:

(1) Areas containing little or no mineral deposits.

(2) Areas containing significant mineral deposits.

(3) Areas containing mineral deposits, the significance of which requires further evaluation.

(c) As it is completed by county, the State Geologist shall transmit such information to the board for incorporation into the state policy and for transmittal to lead agencies.

2762. (a) Within 12 months of receiving the mineral information described in Section 2761, and also within 12 months of the designation of an area of statewide or regional significance within its jurisdiction, every lead agency shall, in accordance with state policy, establish mineral resource management policies to be incorporated in its general plan which will:

(1) Recognize mineral information classified by the State Geologist and transmitted by the board.

(2) Assist in the management of land use which affect areas of statewide and regional significance.

(3) Emphasize the conservation and development of identified mineral deposits.

(b) Every lead agency shall submit proposed mineral resource management policies to the board for review and comment prior to adoption.

(c) Any subsequent amendment of the mineral resource management policy previously reviewed by the board shall also require review and comment by the board.

(d) Prior to permitting a use which would threaten the potential to extract minerals in an area classified by the State Geologist as an area described in paragraph (3) of subdivision (b) of Section 2761, the lead agency may cause to be prepared an evaluation of the area in order to ascertain the significance of the mineral deposit located therein. The results of such evaluation shall be transmitted to the State Geologist and the board.

Article 5. Reclamation Plans and the Conduct of Surface Mining Operations

2770. Except as specified in Section 2776, no person shall conduct surface mining operations unless a permit is obtained from, and a reclamation plan has been submitted to, and approved by, the lead agency for such operation pursuant to this article.

2771. Whenever a proposed surface mining operation is within the jurisdiction of two or more public agencies, is a permitted use within the agencies, and is not separated by a natural or manmade barrier coinciding with the boundary of the agencies, the evaluation of the proposed operation shall be made by the lead agency in accordance with the procedures adopted by the lead agency pursuant to Section 2774. In the event that a dispute arises as to which is the lead agency, any public agency which is a party to the dispute may submit the matter to the board; and the board shall designate the lead agency, giving due consideration to the capability of such agency to fulfill adequately the requirements of this chapter.

2772. The reclamation plan shall be filed with the lead agency on a form provided by the lead agency, by any person who owns, leases, or otherwise controls or operates on all, or any portion of any, mined lands, and who plans to conduct surface mining operations thereon.

The reclamation plan shall include the following information and documents:

(a) The name and address of the operator and the names and addresses of any persons designated by him as his agents for the service of process.

(b) The anticipated quantity and type of minerals for which the surface mining operation is to be conducted.

(c) The proposed dates for the initiation and termination of such operation.

(d) The maximum anticipated depth of the surface mining operation.

(e) The size and legal description of the lands that will be affected by such operation, a map that includes the boundaries and topographic details of such lands, a description of the general geology of the area, a detailed description of the geology of the area in which surface mining is to be conducted, the location of all streams, roads, railroads, and utility facilities within, or adjacent to, such lands, the location of all proposed access roads to be constructed in conducting such operation, and the names and addresses of the owners of all surface and mineral interests of such lands.

(f) A description of and plan for the type of surface mining to be employed and a time schedule that will provide for the completion of surface mining on each segment of the mined lands so that reclamation can be initiated at the earliest possible time on those portions of the mined lands that will not be subject to further disturbance by the surface mining operation.

(g) A description of the proposed use or potential uses of the land after reclamation and evidence that all owners of a possessory interest in the land have been notified of the proposed use or potential uses.

(h) A description of the manner in which reclamation, adequate for the proposed use or potential uses will be accomplished, including: (1) a description of the manner in which contaminants will be controlled, and mining waste will be disposed; and (2) a description of the manner in which rehabilitation of affected streambed channels and streambanks to a condition minimizing erosion and sedimentation will occur.

(i) An assessment of the effect of implementation of the reclamation plan on future mining in the area.

(j) A statement that the person submitting the plan accepts responsibility for reclaiming the mined lands in accordance with the reclamation plan.

(k) Any other information which the lead agency may require by ordinance.

2773. The reclamation plan shall be applicable to a specific piece of property or properties, and shall be based upon the character of the surrounding area and such characteristics of the property as type of overburden, soil stability, topography, geology, climate, stream characteristics, and principal mineral commodities.

2774. Every lead agency shall adopt ordinances establishing procedures for the review and approval of reclamation plans and the issuance of a permit to conduct surface mining operations. Such procedures shall require at least one public hearing and periodic inspections of surface mining operations, and may include provisions for liens, surety bonds, or other security to guarantee reclamation in accordance with the reclamation plan. Such ordinances shall be continuously reviewed and revised, as necessary, in order to ensure that such ordinances are in accordance with state policy. Lead agencies shall notify the State Geologist of the filing of an application for a permit to conduct surface mining operations.

On request of a lead agency, the State Geologist shall furnish technical assistance to assist in the review of reclamation plans.

2775. (a) An applicant whose request for a permit to conduct surface mining operations in an area of statewide or regional significance has been denied by a lead agency, or any person who is aggrieved by the granting of a permit to conduct surface mining operations in an area of statewide or regional significance, may, within 15 days of exhausting his rights to appeal in accordance with the procedures of the lead agency, appeal to the board.

(b) The board may, by regulation, establish procedures for declining to hear appeals that it determines raise no substantial issues.

(c) Appeals that the board does not decline to hear shall be scheduled and heard at a public hearing held within the jurisdiction of the lead agency which processed the original application within 30 days of the filing of the appeal, or such longer period as may be mutually agreed upon by the board and the person filing the appeal. In any such action, the board shall not exercise its independent judgment on the evidence but shall only determine whether the decision of the lead agency is supported by substantial evidence in the light of the whole record. If the board determines the decision of

the lead agency is not supported by substantial evidence in the light of the whole record it shall remand the appeal to the lead agency and the lead agency shall schedule a public hearing to reconsider its action.

2776. No person who has obtained a vested right to conduct surface mining operations prior to January 1, 1976, shall be required to secure a permit pursuant to the provisions of this chapter as long as such vested right continues; provided, however, that no substantial changes may be made in any such operation except in accordance with the provisions of this chapter. A person shall be deemed to have such vested rights if, prior to January 1, 1976, he has, in good faith and in reliance upon a permit or other authorization, if such permit or other authorization was required, diligently commenced surface mining operations and incurred substantial liabilities for work and materials necessary therefor. Expenses incurred in obtaining the enactment of an ordinance in relation to a particular operation or the issuance of a permit shall not be deemed liabilities for work or materials.

A person who has obtained a vested right to conduct surface mining operations prior to January 1, 1976, shall submit to the lead agency and receive, within a reasonable period of time, approval of a reclamation plan for operations to be conducted after January 1, 1976, unless a reclamation plan was approved by the lead agency prior to January 1, 1976 and the person submitting the plan has accepted responsibility for reclaiming the mined lands in accordance with the reclamation plan.

Nothing in this chapter shall be construed as requiring the filing of a reclamation plan for, or the reclamation of, mined lands on which surface mining operations were conducted prior to January 1, 1976.

2777. Amendments to an approved reclamation plan may be submitted detailing proposed changes from the original plan. Substantial deviations from the original plan shall not be undertaken until such amendment has been filed with, and approved by, the lead agency.

2778. Reclamation plans, reports, applications, and other documents submitted pursuant to this chapter are public records, unless it can be demonstrated to the satisfaction of the lead agency that the release of such information, or part thereof, would reveal production, reserves, or rate of depletion entitled to protection as proprietary information. The lead agency shall identify such proprietary information as a separate part of the application. Proprietary information shall be made available only to the State Geologist and to persons authorized in writing by the operator and by the owner.

A copy of all reclamation plans, reports, applications, and other documents submitted pursuant to this chapter shall be furnished to the State Geologist by lead agencies on request.

2779. Whenever one operator succeeds to the interest of another in any incompleted surface mining operation by sale, assignment, transfer, conveyance, exchange, or other means, the successor shall be bound by the provisions of the approved reclamation plan and the provisions of this chapter.

Article 6. Areas of Statewide or Regional Significance

2790. After receipt of mineral information from the State Geologist pursuant to subdivision (c) of Section 2761, the board may by regulation adopted after a public hearing designate specific geographic areas of the state as areas of statewide or regional significance and specify the boundaries thereof. Such designation shall be included as a part of the state policy and shall indicate the reason for which the particular area designated is of significance to the state or region, the adverse effects that might result from premature development of incompatible land uses, the advantages that might be achieved from extraction of the minerals of the area, and the specific goals and policies to protect against the premature incompatible development of the area.

2791. The board shall seek the recommendations of concerned federal, state, and local agencies, educational institutions, civic and public interest organizations, and private organizations and individuals in the identification of areas of statewide and regional significance.

2792. Neither the designation of an area of regional or statewide significance nor the adoption of any regulations for such an area shall in any way limit or modify the rights of any person to complete any development that has been authorized pursuant to Part 2 (commencing with Section 11000) of Division 4 of the Business and Professions Code, pursuant to the Subdivision Map Act (Division 2 (commencing with Section 66410) of Title 7 of the Government Code), or by a building permit or other authorization to commence development, upon which such person relies and has changed his position to his substantial detriment, and, which permit or authorization was issued prior to the designation of such area pursuant to Section 2790. If a developer has by his actions taken in reliance upon prior regulations obtained vested or other legal rights that in law would have prevented a local public agency from changing such regulations in a way adverse to his interests, nothing in this chapter authorizes any governmental agency to abridge those rights.

2793. The board may, by regulation adopted after a public hearing, terminate, partially or wholly, the designation of any area of statewide or regional significance on a finding that the direct involvement of the board is no longer required.

APPENDIX A–2

State Mining and Geology Board *Resolution 22*

APPENDIX A-2

STATE MINING AND GEOLOGY BOARD

State of California

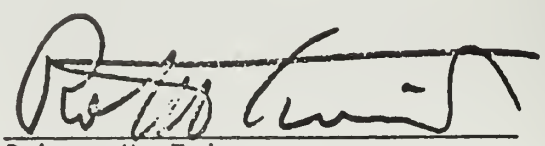
RESOLUTION NO. 22

WHEREAS the Board recognizes the importance of prioritizing classification projects so that potential mineral lands that are most likely to be converted to uses that are incompatible with mining are classified first (in conformance with Section 2761(b) of the Surface Mining and Reclamation Act of 1975 (SMARA) and the Guidelines for Classification and Designation of Mineral Lands adopted by the Board on June 30, 1978) and,

WHEREAS the Board recognizes the importance of periodically reviewing classification priorities to insure that the mineral resource conservation objectives of SMARA and the Board's guidelines are being met within existing funding and staffing constraints,

THEREFORE be it resolved that the prioritized list of mineral lands classification projects as adopted on January 13, 1978 be revised. The revised list as attached separates urban from non-urban and other areas for classification purposes. Priority is to be given to urban areas and their geographical subdivisions.

ADOPTED: November 2, 1978



Robert H. Twiss
Chairman

APPENDIX A-2

November 2, 1978

Priorities for Mineral Lands Classification

I. Urban Areas

Priority 1

A. Greater Los Angeles Basin
B. East San Francisco Bay Counties

Priority 2

A. South, West and North San Francisco Bay Counties
B. Sacramento - San Joaquin Valley Urbanizing Areas

Priority 3

A. Western San Diego County
B. Coastal Ventura and Santa Barbara County Areas
C. Solano-Napa-Yolo Urbanizing Areas
D. Bakersfield and Palmdale Areas
E. San Luis Obispo - Santa Maria Area
F. Fresno Area

II. Non-Urban And Other Areas Not Covered Above

Priority 1

California Desert Conservation Area (CDCA)

Priority 2

Forest Lands - RARE II Areas

Priority 3

Other Areas

APPENDIX A–3

State Mining and Geology Board *Guidelines for Classification and Designation of Mineral Lands*

EDMUND G. BROWN
GOVERNOR OF CALIF.

THE RESOURCES AGENCY OF CALIFORNIA
DEPARTMENT OF CONSERVATION

STATE MINING AND GEOLOGY BOARD

1335 RESOURCES BUILDING
1416 - 9TH STREET, SACRAMENTO 95814
(916) 322-1082

July 13, 1978

SUBJECT: Guidelines for Classification and Designation of Mineral Lands

The Surface Mining and Reclamation Act of 1975 (SMARA) requires the State Mining and Geology Board to adopt state policies relative to mineral resource production and conservation.

Pursuant to this requirement the Board adopted the Guidelines for Classification and Designation of Mineral Lands following a June 30, 1978 public hearing held in Sacramento. A copy of these Guidelines is attached for your information.

The Board has not yet adopted a policy on California Environmental Quality Act (CEQA) compliance as it relates to designation of mineral lands, page 17 of the Guidelines. In considering such a policy the Board will be guided by the Attorney General's Opinion SO 78/5 IL of June 19, 1978 which states that:

1. The designation by the State Mining and Geology Board of an area as being of regional or statewide significance is an activity which requires compliance with CEQA and an environmental impact report will be required if the designation may have a significant effect on the environment.

2. The State Mining and Geology Board is the appropriate lead agency for preparing environmental documents relating to the designation of mineral lands.

Questions concerning SMARA and Board policies should be directed to D.W. Spreg Special Representative to the Board, (916) 322-1082.

Robert H. Twiss

Robert H. Twiss
Chairman

Attachment

GUIDELINES

FOR

CLASSIFICATION AND DESIGNATION OF MINERAL LANDS

Prepared By

The State Mining and Geology Board
1416 Ninth Street, Room 1335
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PREFACE

The Surface Mining and Reclamation Act of 1975, enacted as Chapter 9, Division 2 of the Public Resources Code, requires the State Mining and Geology Board to adopt state policies relative to mineral resource production and conservation.

Pursuant to this requirement the Board adopted the Guidelines for Classification and Designation of Mineral Lands following a June 30, 1978 public hearing held in Sacramento, California.

CHAPTER 8. Mining and Geology

SUBCHAPTER 1. State Mining and Geology Board

Article II. GUIDELINES FOR CLASSIFICATION AND DESIGNATION OF MINERAL LANDS

INTRODUCTION - The purpose of these guidelines is to implement the Surface Mining and Reclamation Act of 1975 by providing direction to the State Geologist in carrying out mineral resource classification of lands in California that are threatened by uses which would be incompatible with or would preclude mining. In addition, these guidelines establish procedures by which the State Mining and Geology Board may designate mineral-bearing areas of statewide or of regional significance.

Classification is the process of identification of lands containing significant mineral deposits. Designation is the formal recognition by the Board, after consultation with lead agencies and other interested parties, of areas containing mineral deposits of regional or statewide significance that should be protected from land uses incompatible with mineral extraction. The objective of the classification and designation processes is to insure, through appropriate lead agency policies and procedures, that mineral deposits of statewide or of regional significance are available when needed.

It is the Board's intention to review the guidelines from time to time and to revise them as necessary.

SECTION I. GUIDELINES FOR CLASSIFICATION OF MINERAL LANDS

1. Classification Criteria

a) In accordance with these guidelines and a schedule adopted by the Board, the State Geologist shall classify areas of the State threatened by land uses incompatible with or that would preclude mining. Such areas will be

classified into Mineral Resource Zones (MRZ) and Scientific Resource Zones (SZ) as defined in this section and shall be based on geologic and economic factors without regard to existing land use and land ownership. The areas to be studied and their order of study shall be specified by the Board in consultation with the State Geologist.

b) To be considered significant for the purpose of the classification of mineral lands a mineral deposit, or a group of deposits that can be mined as a unit, must meet the following criteria of marketability and threshold value. In these guidelines the term mineral deposits denotes natural occurrences of rock or mineral materials in or on the earth's crust that are known to be economically minable and such rock or mineral materials that are not minable at present but which may come into such demand as to become economically minable in the foreseeable future. The term mineral resources is used herein as a collective term for all mineral deposits of a particular kind, or for mineral deposits in general. The size of mineral deposits for the purpose of evaluating marketability and threshold value shall include the amounts of naturally occurring rock or mineral material of known or potential economic interest that can be measured, indicated or inferred by using available geologic and geophysical evidence in commonly accepted fashion. The terms measured, indicated and inferred are to be used as defined by the U.S. Bureau of Mines and the U.S. Geological Survey in U.S. Geological Survey Bulletin 1450-A.

1) Marketability - In determining marketability, mineral deposits shall be divided into two categories, those containing non-strategic and those containing strategic mineral commodities. Unique or rare occurrences of rocks, minerals or fossils that are of outstanding scientific significance are not required to meet marketability criteria.

1) Non-strategic mineral commodities are those which are available domestically and of which the United States imports less than 65% of its needs as reported annually by the U.S. Bureau of Mines. Deposits of mineral commodities in this category must be minable, processable and marketable under the technologic and economic conditions that exist at present or which can be estimated to exist in the foreseeable future. The amount of mineral resources needed for periods of the foreseeable future (50 years) shall be projected using past consumption figures, with appropriate adjustments based upon anticipated changes in market conditions and mining technology.

ii) Strategic mineral commodities are those that are in short domestic supply and important for national defense or the wellbeing of the domestic economy. For the purposes of these guidelines they are those mineral commodities of which the United States imports more than 65% of its needs, as reported annually by the U.S. Bureau of Mines, that are judged to be minable, processable and marketable in the foreseeable future if non-domestic sources of supply are cut off.

iii) Foreseeable future, as used in this paragraph and elsewhere in the guidelines is a time span of approximately 50 years. Because some of the conditions affecting extraction and marketability cannot be accurately projected 50 years into the future, conservative estimates shall be made in assessing whether a particular mineral resource can be mined, processed and marketed within the next 50 years.

2) Threshold value is the projected value (gross selling price) of the first marketable product from an individual mineral deposit or from a group

of deposits that can be operated as a unit, upon completion of extraction and any required mineral separation and processing. For those deposits which meet the marketability criteria, only those estimated to exceed the following threshold values in 1978-equivalent dollars shall be considered significant. These threshold values are intended to indicate in a general way the approximate minimum size of a mineral deposit that will be considered significant for classification and designation. They are not intended, nor could they in practice, be used as precise cut off values. For some deposits in some areas larger or smaller values than those specified would be required for a marketable deposit. If for technological or other reasons one or more parts of a mineral deposit cannot meet the marketability criteria these parts shall not be considered in estimating whether the deposit exceeds the threshold value.

i) Construction materials (minimum value $5,000,000) - Mineral materials capable of being used in construction, such as sand and gravel or crushed rock, which normally receive minimal processing, commonly washing and grading, and for which the ratio of transportation costs to value of the processed material at the mine is high.

ii) Industrial and chemical mineral materials (minimum value $1,000,000) Non-metallic mineral materials that normally receive extensive processing, such as heat or chemical treatment or fine sizing, and for which the ratio of transportation costs to value of the material at the mine is moderate or low. Examples of this category include:

Limestone, dolomite and marble except where used as construction aggregate
Specialty sands
Clays
Diatomite
Phosphate
Coal, lignite or peat mined primarily as a raw material for chemicals such as montan wax

Salines and evaporates such as borates and gypsum
Feldspar
Talc
Building and demension stone
Asbestos
Rock varieties producible into granules, rock flour, mineral wool, expanded shale, pozzolans and other similar commodities

iii) Metallic and rare minerals (minimum value $500,000) - Metallic elements and minerals, gemstones, and minerals that possess special properties valuable to science or industry. The ratio of transportation costs to the value of the material at the mine for this category is low. Examples include ores, deposits or crystals of:

Precious metals (gold, silver, platinum)
Iron and other ferro alloy metals (iron, tungsten, chromium, manganese)
Base metals (copper, lead, zinc)
Mercury
Uranium and thorium except syngenetic deposits in shale
Rare earths
Minor metals including rubidium and cesium
Gemstones and semi-precious materials
Niobium, tantallium
Optical grade calcite

iiii) Non-fluid mineral fuels (minimum value $1,000,000) - Non-hydrothermal mineral fuels occurring in sedimentary rocks. Examples include:

Coal
Lignite
Peat
Organic shale
Tar sand
Uranium and thorium (syngenetic deposits in shale)

iiiii) Unique or rare occurrences of rocks, minerals or fossils that are of outstanding scientific significance (no threshold value).

Mineral Resource Zones (MRZ) and Scientific Resource Zone (SZ)

The following MRZ and SZ categories shall be used by the State Geologist in classifying the State's lands. The geologic and economic data and the arguments upon which each unit MRZ or SZ assignment is based shall be presented in the land classification information transmitted by the State Geologist to the Board.

a) MRZ-1 Areas where adequate information indicates that no significant mineral deposits are present, or where it is judged that little likelihood exists for their presence. This zone shall be applied where well developed lines of reasoning, based upon economic geologic principles and adequate data, demonstrate that the likelihood for occurrence of significant mineral deposits is nil or slight.

b) MRZ-2 Areas where adequate information indicates that significant mineral deposits are present or where it is judged that a high likelihood for their presence exists. This zone shall be applied to known mineral deposits or where well developed lines of reasoning, based upon economic geologic principles and adequate data, demonstrate that the likelihood for occurrence of significant mineral deposits is high.

c) MRZ-3 Areas containing mineral deposits the significance of which cannot be evaluated from available data.

d) MRZ-4 Areas where available information is inadequate for assignment to any other MRZ zone.

e) SZ Areas containing unique or rare occurrences of rocks, minerals or fossils that are of outstanding scientific significance shall be classified in this zone.

3. Documentation and Transmittal of Mineral Lands Classification Data

a) Areas assigned by the State Geologist to mineral resource zones shall be delineated on suitable maps of a scale adequate for use on lead agency general plan maps. These maps shall also show the boundaries of each permitting authority in the report area.

b) A map at a convenient scale and a summary report showing the mineral lands classification for an entire county or, at the direction of the Board, major subdivisions of a county, or a major mineral district that includes

portions of two or more counties, shall be prepared after classification is complete. Each map and report shall be submitted to the Board which, after review and approval, shall transmit it to the appropriate lead agencies and make it available to other interested parties.

c) Mineral land classification reports of regions containing Construction Materials classified MRZ-2 shall include the following additional information for each such mineral commodity:

1) The location and an estimate of the total quantity of each such construction material that is geologically available for mining in the report region. The limits of the region shall be considered to be the consumption areas for each potentially producible construction mineral commodity under consideration.

2) An estimate of the total quantity of each such construction material that will be needed to supply the requirements of both the county and the marketing region in which it occurs for the next 50 years. The marketing region is defined as the area within which such material is usually mined and marketed. The amount of each construction material mineral resource needed for the next 50 years shall be projected using past consumption rates adjusted for anticipated changes in market conditions and mining technology. These estimates shall be periodically reviewed as provided in Section 1, Subsection 7.

4. Classification Priorities

Potential mineral lands that are most likely to be converted to uses that are incompatible with mining or which would preclude mining shall be classified first. Where the risk of conversion to incompatible land uses is equal, those areas with mineral deposits of greatest statewide or regional significance shall be classified first. The potential for loss may be through the process

of urbanization or through other irreversible uses of the mineral lands or of adjoining lands, with which mineral extraction would be incompatible.

5. Petitions for Mineral Lands Classification

a) Petitions may be brought before the Board by any individual or organization to classify mineral lands that are claimed to contain significant mineral deposits and which are claimed to be threatened by land uses incompatible with mining. Classification is a prerequisite to designation of regional or statewide significance. Once an area is classified as MRZ-2 or SZ, a petition may be submitted for designation consideration under Section II, Subsection 4. If a petitioner can supply sufficient geologic and economic data to support an MRZ-2 or SZ classification by the State Geologist, he may also petition the Board to consider designation. It is expected that such a joint petition will include detailed information, and supportive data on the amounts and value of mineral deposits claimed to be MRZ-2 or SZ and other information required under Section II, Subsection 4, Petitions for Designation. The threat to a mineral deposit may be due to incompatible uses of adjoining lands that would preclude mining, as well as to mineral lands themselves. Petitions submitted to the Board shall include the following information.

1) The petitioner's name, mailing address and interest (beneficial, jurisdictional, or other) in the area to be considered for classificatio

2) A map (USGS 7 1 2' quadrangle or other appropriate map) showing the boundaries of the area the petitioner wishes to be classified.

3) A description of the significant mineral deposits claimed to occur within the area described, including sufficient geologic and economic data to support the claim that the mineral deposits are significant as defined in these guidelines.

4) The imminency of the threatened change, if any, in the use of land containing the claimed significant mineral deposits to a use which would prevent their mining. The petitioner should be prepared to supply full documentation if requested.

5) The name and mailing address of each recorded land owner and each recorded lessee in and adjoining the area described.

b) The State Geologist shall make an evaluation of the data submitted in the petition as to its accuracy and sufficiency and determine if the area can be classified on the basis of both submitted and other readily available information. A recommendation shall be then submitted to the Board concerning:

1) The urgency of the requested classification.

2) The sufficiency of the submitted and other readily available data as a basis for classification, and the scope of any additional investigation required.

3) An estimation of the time required to classify the area.

c) Following the State Geologist's report, the Board shall determine the priority for classification of the land described in the petition in relation to other areas in the State's mineral lands classification program. Classification of the area will then proceed according to its assigned priority.

Lead Agency Responsibilities

a) Within 12 months of receiving the mineral lands classification map and report, every lead agency shall, in accordance with state policy, develop and adopt mineral resource management policies to be incorporated in its general plan which will:

1) Recognize the mineral classification information, including the classi-

fication maps, transmitted to it by the Board and include the classification maps in its general plan.

2) Emphasize the conservation and development of identified significant mineral deposits.

b) Every lead agency shall submit its proposed mineral resource management policies to the Board for review and comment prior to adoption.

c) Any subsequent amendment of the mineral resource management policies previously reviewed by the Board shall also require review and comment by the Board.

d) Prior to permitting a use which would threaten the potential to extract minerals classified by the State Geologist as MRZ-3, the lead agency may cause to be prepared an evaluation of the area in order to ascertain the statewide or regional significance of the mineral deposits known or inferred to be located therein. The results of such an evaluation shall be transmitted to the State Geologist and to the Board for review and comment.

7. Periodic Review of Classified Lands

a) After a period not to exceed 10 years following transmittal of mineral la classification information to lead agencies the State Geologist shall rev the information to determine whether:

1) A reclassification of the area is necessary.

2) The projected requirements for Construction Materials (Subsection 3c of Section I of these guidelines) for 50 years should be revised.

The State Geologist shall report the results of such reviews to the Board together with his recommendations.

b) The Board may direct the State Geologist to reexamine mineral lands alre classified on the basis of his recommendation, or for other reasons. An

resulting reclassification shall be treated in the same manner as the original classification, and employ the same marketability and threshold criteria. The approximate span of time indicated above as being "the foreseeable future" for purposes of estimating marketability shall begin anew at time of reclassification.

SECTION II. PROCEDURES FOR DESIGNATION OF LANDS CONTAINING SIGNIFICANT MINERAL DEPOSITS

Designation Criteria

Areas to be considered for designation by the Board will contain one or more mineral deposits of statewide or regional significance. Ordinarily, classification of an area as MRZ-2 by the State Geologist will constitute adequate evidence that an area contains significant mineral deposits, but other data shall be considered by the Board in determining the significance of specific mineral deposits and the desirability of designation.

Designation Procedures

a) Upon receipt from the State Geologist of a mineral lands classification map and report delineating one or more areas classified as MRZ-2 or SZ, the Board shall:

   1) Review the map and report to determine the sufficiency of the submitted data as a basis for designation, and request such additional information as may be required from the State Geologist or other sources.

   2) Determine the need for, and the priority of, designating the MRZ-2 and SZ areas, taking into consideration the importance of the mineral deposits to the State or region thereof and the imminency of any threatened land use changes that would be incompatible with mineral extraction.

3) Notify the appropriate lead agencies of the decision to consider designation of one or more mineral resource areas within their jurisdiction.

4) Set a date and place for a public hearing to consider the areas which the Board proposes to designate as containing mineral deposits of statewide or regional significance. If practicable, the public hearing shall be held in or near the county in which the area proposed for designation occurs.

5) Notify all affected agencies and parties having an interest in the lands considered for designation.

b) At the public hearing to consider proposed designations, the Board shall seek the recommendations of concerned federal, state and local agencies, educational institutions, civic and public interest organizations, and private organizations and indivduals in the identification of mineral deposits of statewide or of regional significance. Such review and comment should address:

1) The adequacy of the mineral land classification data transmitted by the State Geologist and of any additional data transmitted by the Board, which together will constitute the principal basis for designation.

2) Additional data bearing on the presence and marketability of mineral deposits proposed to be of statewide or of regional significance in the area under consideration.

3) The need, amount and location of mineral deposits of regional significance, namely Construction Materials as defined in Section 1, Subsection 1b of these guidelines, that should be designated to provide for the needs of the region for 50 years.

4) The need for the proposed designation of each mineral deposit of statewide significance, namely, Industrial and Chemical Mineral Materials, Metallic and Rare Minerals, Non-fluid Mineral Fuels, and Rocks, Minerals and Fossils of Outstanding Scientific Significance, as defined in Section 1, Subsection 1b of these guidelines. Ordinarily, such deposits are uncommon or rare, and economically significant occurrences warrant designation. However, some types, such as low grade limestone, low grade clays and other rock varieties that may be processed into valuable mineral products are often present in such large quantities that designation would be warranted only where special circumstances exist. Such circumstances might include proximity of a mineral deposit to markets, transportation, energy sources, or to other raw materials with which they could be combined to produce more valuable products.

5) The existing uses of the areas proposed for designation and the future uses of these areas adopted by local agencies.

6) Values relating to recreation, watershed, wildlife, range and forage, and aesthetic enjoyment.

c) Following the public hearing, the Board may designate to be of statewide or regional significance, and include in state policy, all or part of the areas classified as MRZ-2 or SZ. The designation shall specify the following:

1) The boundaries of the designated area.

2) The mineral deposits of statewide or of regional significance contained in each designated area and an estimate of the amount of each mineral

commodity that is available for mining under present or foreseeable technologic, economic and land use conditions, for MRZ-2 areas, or a description of the materials of scientific value in the SZ area.

3) The reason that each designated area is of significance to the State or region, the advantages to the State or region, that might be achieved from the extraction of the minerals of the area, and the adverse effects that might result from premature development to land uses which would preclude mining.

4) The time limit, if any, for the designation.

5) The specific goals and policies to protect the areas containing minera deposits designated to be of statewide or regional significance from premature development to uses which would preclude mining, or to uses with which mining would be incompatible.

6) Lead agencies having jurisdiction over the area.

3. Lead Agency Designation Responsibilities

a) Upon designating an area containing significant mineral deposits the Boar will transmit a report of its action to the affected lead agencies. The report will include a map of the designated areas at a scale suitable for general plan purposes.

b) Every lead agency within 12 months of the designation of an area of state wide or regional significance within its jurisdiction, shall:

1) Recognize and include in its general plan the designated areas of statewide and regional significance transmitted to it by the Board.

2) Develop and adopt policies for the management of land use of areas classified MRZ-2 or SZ and designated by the Board as areas of statew and regional significance to protect those areas from premature devel- ment incompatible with mining.

3) Emphasize the conservation and development of mineral deposits designated by the Board to be of statewide or regional significance.

c) Prior to the adoption of mineral resource management policies, lead agencies shall submit them to the Board for review and comment. The Board shall make its comment within 60 days of receipt of the proposed policies. Any subsequent amendment to these resource management policies shall also require Board review and comment.

d) The Board shall continuously monitor local government implementation of its mineral resource management policies for designated areas.

Petitions for Designation

a) Prior to permitting a use which would threaten the potential to extract minerals classified by the State Geologist as MRZ-2 or SZ but not yet designated, the lead agency may petition the Board for a designation hearing.

b) Petitions for a designation hearing may also be brought before the Board by any other party provided that the Board has received and approved land classification information that indicates that the area in question is classified MRZ-2 or SZ and that the Board has not yet considered designation. Petitions submitted to the Board shall include the following information.

1) The petitioner's name, mailing address and interest (beneficial, jurisdictional, or other) in the area to be considered for designation.

2) A map (USGS 7 1/2' quadrangle or other appropriate map) showing the boundaries of the MRZ-2 or SZ area the petitioner wishes to be designated.

3) The reasons for requesting designation.

4) The name and mailing address of each recorded land owner and each recorded lessee in and adjoining the area described.

The Board shall then evaluate the data submitted in the petition as to its accuracy and sufficiency. If the Board finds that the petition contai sufficient information and arguments to require a public hearing then the Board shall schedule such a hearing and proceed as outlined in this sectio

5. Termination of Designation Status

a) The status of mineral lands previously designated to be of statewide or regional significance may be terminated, either partially or wholly, by the Board on a finding that the protection afforded by designation is no longer necessary. In making this finding the Board shall consult with affected lead agencies as to the desirability of terminating designation. Such a finding may result from, but not limited to the following reasons:

1) Depletion of the mineral deposit or deposits within the designated ar

2) The mineral deposit or deposits within the designated area are shown to be in excess of quantities required for present or foreseeable future statewide or regional needs.

3) Ending of the time limit, if any, for the designation to be in force.

b) Prior to making such a finding, the Board shall hold a public hearing. If practicable it shall be held in or near the county in which the desig- nated areas occur.

c) Petitions may be brought before the Board to terminate the designated status of mineral lands. Petitions submitted to the Board shall include the following information:

1) The petitioner's name, mailing address and interest (beneficial, juri- dictional or other) in the petitioned area.

2) A map (USGS 7 1/2' quadrangle or other appropriate map) and legal description of the petitioned area.

3) Reference shall be made to the specific Board action which designated the area.

4) The reasons and supporting data as to why direct Board involvement is no longer necessary.

The Board shall then evaluate the data submitted in the petition as to its accuracy and sufficiency. If the Board finds that the petition contains sufficient information and arguments to require a public hearing on termination, then the Board shall schedule such a hearing and proceed as outlined in this section.

CEQA Compliance (Reserved pending Attorney General's Opinion).

APPENDIX B

Sample copy of Los Angeles County Regional
Planning Commission Quarterly Bulletin,
Population and Housing Units

Quarterly Bulletin, No. 131, January 1, 1976

quarterly bulletin

DEPARTMENT OF REGIONAL PLANNING · COUNTY OF LOS ANGELES, CALIFORNIA

POPULATION IN SLIGHT INCREASE GENERAL TREND UNCHANGED

The number of Los Angeles County residents remained relatively unchanged during the second half of 1975. The Department estimates that on January 1, 1976 the County had a total population of 6,994,700. This represents a July through December gain of approximately 2,400 as compared with a loss of 28,500 in the first half. However, no particular significance should be given to these 1975 countywide gains and losses. Rather, the Department continues to believe that they represent minor fluctuations along what is essen-

(Continued on page 6)

SINGLE UNITS CLIMB SHARPLY—MULTIPLE UNITS HOLD FIRM IN SECOND HALF

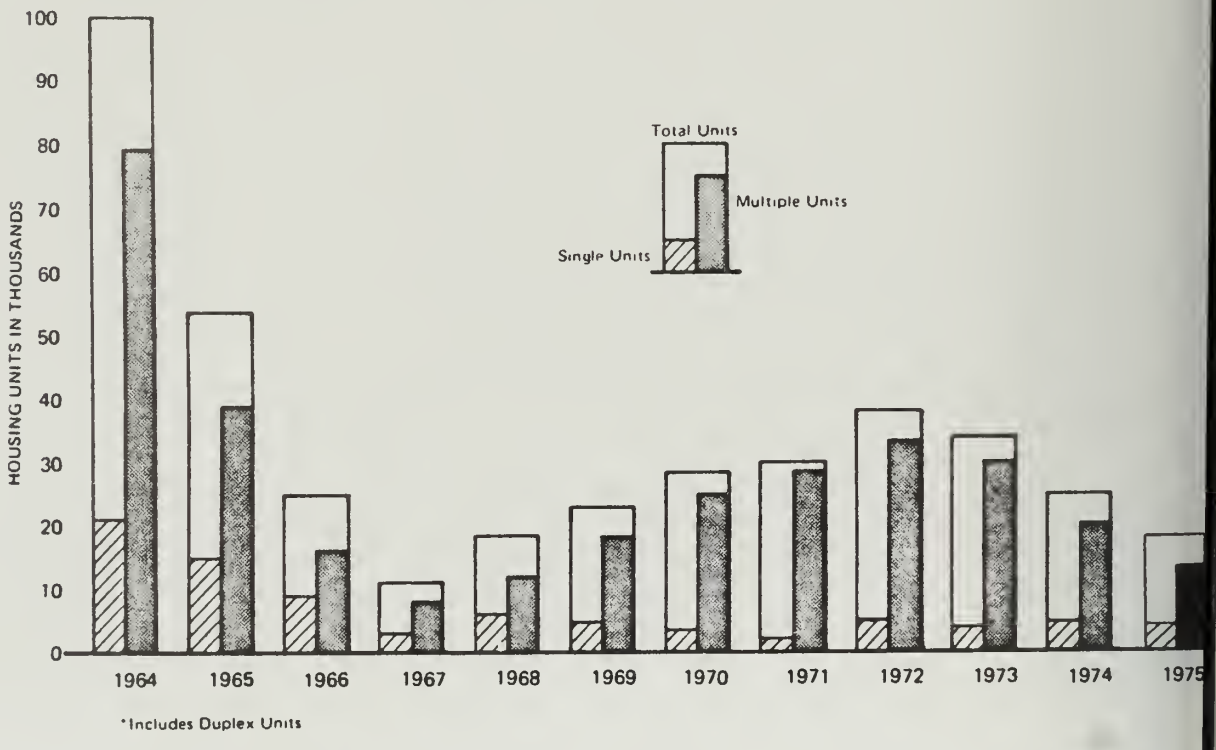
Net additions to single units climbed sharply and multiple units held firm in the second half of 1975. The 9,706 total units added in these six months fell slightly short of the 9,727 units recorded in the same period of 1974.

Single unit additions in the last six months totaled 2,924 or 1,733 units more than in the first half. This was the greatest number of single units added in any second half since 1968.

Multiple units added in last year's second half to-

(Continued on page 6)

LOS ANGELES COUNTY
ANNUAL NET HOUSING UNIT CHANGE
1964–1975



*Includes Duplex Units

For Additional Information: *Call or write the Population Research Section, Los Angeles County Department of Regional Planning, 320 West Temple St., Los Angeles 90012, 974-6425.*

Quarterly Bulletin, No. 131, January 1, 1976

POPULATION AND HOUSING UNITS
LOS ANGELES COUNTY STATISTICAL AREAS

MSA and SA No.	Name or Jurisdiction	1970 CENSUS Revised Population	1970 CENSUS Revised Housing Units	JANUARY 1, 1976 Estimated Housing Units	JANUARY 1, 1976 Estimated Population
LOS ANGELES COUNTY ..		7,041,980	2,541,603	2,716,766	6,994,724
TOTAL ALL CITIES		6,008,523	2,221,824	2,377,905	5,973,200
TOTAL UNINCORPORATED		1,033,457	319,779	338,861	1,021,524
TOTAL FOR CITIES IN TWO OR MORE STATISTICAL AREAS					
	Carson	71,150	18,430	22,101	78,661
	Compton	78,547	21,929	21,673	72,538
	Industry	712	156	149	680
	Lakewood	83,025	24,263	25,418	79,492
	Los Angeles	2,811,801	1,074,173	1,131,406	2,746,135
	Rosemead	40,972	13,430	13,597	39,842
	Santa Fe Springs	14,750	3,764	4,323	15,826
	Temple City	31,034	10,998	11,240	29,110
	Torrance	134,968	45,528	49,322	133,953
	West Covina	68,034	19,154	22,931	73,277
	Whittier	72,863	25,817	27,173	70,961
1.0	ADAMS AREA	469,892	181,648	185,956	451,147
1.11	Part of Los Angeles	48,376	21,259	22,746	47,715
1.12	Part of Los Angeles	53,080	20,783	20,762	50,915
1.13	Part of Los Angeles	97,372	38,495	38,628	91,059
1.14	Part of Los Angeles	69,156	28,602	28,597	66,706
1.151	Part of Los Angeles	57,096	21,199	20,812	52,798
1.152	Part of Los Angeles	91,558	31,895	31,469	85,591
1.2	Culver City	34,451	13,075	16,465	37,666
1.311	Unincorporated	6,535	2,064	2,187	6,851
1.312	Unincorporated	12,268	4,276	4,290	11,846
2.0	AVALON AREA	1,906	1,174	1,267	1,968
2.1	Avalon	1,520	1,080	1,173	1,591
2.2	Unincorporated	386	94	94	377
3.0	BEVERLY HILLS AREA	92,800	40,517	43,979	92,800
3.1	Beverly Hills	33,416	15,092	15,412	31,825
3.21	Part of Los Angeles	9,869	3,766	4,013	9,849
3.22	Part of Los Angeles	49,466	21,641	24,536	51,077
3.3	Unincorporated	49	18	18	49
4.0	BURBANK AREA	264,922	106,276	110,966	256,271
4.1	Burbank	88,871	35,963	36,689	83,275
4.21	Part of Los Angeles	46,825	14,402	15,124	45,876
4.22	Part of Los Angeles	83,944	35,877	37,555	82,230
4.23	Part of Los Angeles	45,275	20,031	21,595	44,883
4.3	Unincorporated	7	3	3	7
5.0	CALABASAS AREA	18,935	5,838	10,488	30,546
5.111	Unincorporated	6,417	2,013	3,520	10,563
5.112	Unincorporated	4,710	1,345	3,422	10,007
5.12	Unincorporated	6,279	2,106	3,141	8,396
5.2	Hidden Hills	1,529	374	405	1,580
6.0	CHATSWORTH-WEST VALLEY AREA	175,788	51,762	60,310	190,004
6.11	Part of Los Angeles	43,668	12,937	16,679	51,012
6.12	Part of Los Angeles	84,982	25,125	28,899	89,135
6.13	Part of Los Angeles	45,712	13,170	14,206	48,491
6.2	Unincorporated	915	283	285	871
6.3	Unincorporated	511	247	241	495
7.0	CITRUS AREA	264,029	76,824	82,784	264,639
7.1	Azusa	25,217	8,175	9,263	25,194
7.2	Covina	30,395	9,803	11,242	33,104
7.3	Part of West Covina	63,830	18,114	19,889	63,075
7.4	Glendora	31,380	9,403	10,712	34,097
7.511	Unincorporated	13,920	3,517	3,799	14,045
7.512	Unincorporated	13,125	3,563	3,449	12,299
7.521	Unincorporated	23,709	6,265	6,280	22,289
7.522	Unincorporated	14,384	4,095	3,934	12,808
7.6	Baldwin Park	47,285	13,681	14,012	47,002
7.7	Irwindale	784	208	204	726
8.0	COMPTON AREA	177,215	53,139	52,514	160,111
8.1	Part of Compton	78,393	21,893	21,637	72,390
8.2	Lynwood	43,354	15,794	15,099	36,500
8.31	Unincorporated	1,055	357	357	989
8.32	Unincorporated	9,850	3,259	3,211	9,652
8.331	Unincorporated	34,835	9,346	9,545	31,264
8.332	Unincorporated	5,718	1,401	1,530	5,769
8.4	Part of Carson	4,010	1,098	1,135	3,547
9.0	CENTRAL AREA	90,416	48,466	48,179	82,016
9.11	Part of Los Angeles	75,555	40,591	40,464	69,385
9.12	Part of Los Angeles	14,861	7,875	7,715	12,631
10.0	DOMINGUEZ-LOS ANGELES HARBOR AREA	228,608	67,466	72,969	229,494
10.111	Part of Los Angeles	39,915	12,698	12,911	38,986
10.112	Part of Los Angeles	24,714	7,942	8,860	24,794
10.12	Part of Los Angeles	70,240	21,768	23,412	69,602
10.211	Unincorporated	15,918	4,475	5,806	17,698
10.212	Unincorporated	2,827	674	356	1,525
10.213	Unincorporated	5,980	1,948	—	—
10.22	Unincorporated	1,711	584	622	1,627
10.31	Part of Carson	39,948	10,530	11,070	37,917
10.32	Part of Carson	27,192	6,811	7,932	31,692
10.4	Part of Comptan	154	36	36	148
10.5	Part of Carson	(5,980)	(1,948)	1,964	5,505
11.0	EAST AREA	203,387	58,946	58,712	192,280
11.11	Part of Los Angeles	83,040	23,459	23,369	78,347
11.12	Part of Los Angeles	26,605	9,535	9,065	23,070
11.21	Unincorporated	43,492	10,840	11,146	41,707
11.22	Unincorporated	50,250	15,112	15,132	49,156
12.0	EL MONTE AREA	107,641	35,177	34,727	102,610
12.1	El Monte	69,892	23,701	23,689	67,048
12.21	Unincorporated	5,244	1,490	1,441	4,979
12.22	Unincorporated	4,911	1,370	403	1,443
12.3	South El Monte	13,443	3,725	4,313	15,574
12.4	Part of Rosemead	14,151	4,891	4,875	13,566
12.5	Part of Whittier	(0)	(0)	0	0
13.0	ENCINO-CENTRAL VALLEY AREA	364,147	130,638	148,409	377,254
13.11	Part of Los Angeles	55,442	19,159	21,485	56,877
13.12	Part of Los Angeles	34,446	10,664	12,321	37,979
13.13	Part of Los Angeles	78,918	25,260	27,814	78,045
13.14	Part of Los Angeles	136,352	55,892	61,894	138,409
13.15	Part of Los Angeles	58,989	19,663	24,895	65,944
14.0	GLENDALE AREA	241,928	99,047	102,562	235,433
14.1	Glendale	132,664	56 455	59,418	131,234
14.21	Part of Las Angeles	53,725	19,849	19,790	51,120
14.22	Part of Las Angeles	35,919	15,942	16,428	33,895
14.3	Unincorporated	19,620	6,801	6,926	19,184
15.0	HOLLYWOOD AREA	199,715	111,930	118,502	190,137
15.1	Part of Los Angeles	165,093	90,644	94,913	155,038
15.2	Unincorparated	34,622	21,286	23,589	35,099
16.0	INGLEWOOD AREA	348,414	127,435	132,363	326,108
16.1	Gardena	41,021	14,678	17,511	43,124
16.2	Inglewood	89,985	38,346	38,769	81,641
16.3	Hawthorne	53,304	19,692	23,243	55,358
16.4	Part of Torrance	34,601	10,848	11,521	33,507
16.5	Part of Los Angeles	18,378	5,783	5,803	17,801
16.611	Unincorporated	42,707	14,484	12,221	33,218
16.612	Unincorporated	5,195	1,737	1,475	3,980
16.631	Unincorporated	16,121	6,246	6,166	15,147
16.632	Unincorporated	11,997	3,905	3,478	9,552
16.633	Unincorporated	9,846	3,546	3,494	8,774
16.64	Unincorporated	434	232	214	387
16.7	Lawndale	24,825	7,938	8,468	23,619
17.0	LONG BEACH AREA	435,413	173,852	182,329	410,492
17.1	Signal Hill	5,588	2,403	2,410	4,996
17.2	Long Beach	358,879	150,133	159,123	342,054
17.31	Unincorporated	2,477	716	0	0
17.32	Unincorporated	2,153	613	609	2,107
17.33	Unincorporated	143	46	31	89
17.4	Part of Lakewood	66,173	19,941	20,156	61,246
18.0	MONROVIA AREA	141,061	49,571	51,527	136,929
18.1	Arcadia	45,138	16,442	17,457	45,487
18.2	Monrovia	30,562	11,615	11,727	29,071
18.3	Sierra Madre	12,140	4,444	4,563	12,137
18.41	Unincorparated	11,694	3,459	3,530	10,738
18.42	Unincorporated	1,834	628	647	1,849
18.5	Bradbury	838	242	258	861
18.6	Duarte	14,981	4,545	4,942	14,645
18 7	Part of Temple City	23,874	8,196	8,403	22,141

MSA and SA No.	Name or Jurisdiction	1970 CENSUS Revised Population	1970 CENSUS Revised Housing Units	JANUARY 1, 1976 Estimated Housing Units	JANUARY 1, 1976 Estimated Population
19.0	MALIBU AREA	11,709	4,535	6,213	15,609
19.11	Unincorporated	5,637	2,049	3,227	8,355
19.12	Unincorporated	6,072	2,486	2,986	7,254
20.0	NORTH COUNTY AREA	132,966	43,268	54,601	155,758
20.111	Unincorporated	1,519	675	830	1,776
20.112	Unincorporated	7,976	3,064	3,536	8,610
20.113	Unincorporated	38,582	12,322	16,228	44,010
20.114	Unincorporated	3,369	1,455	1,569	3,237
20.121	Unincorporated	13,870	4,282	4,491	13,921
20.122	Unincorporated	4,443	2,036	2,179	4,326
20.123	Unincorporated	2,686	869	914	2,685
20.124	Unincorporated	1,919	607	1,048	3,543
20.131	Unincorporated	3,966	685	1,580	6,126
20.132	Unincorporated	28,759	8,283	10,251	34,289
20.133	Unincorporated	15,353	5,151	6,953	21,109
20.14	Unincorporated	2,013	1,023	968	1,776
20.2	Palmdale	8,511	2,816	3,854	10,354
21.0	NORTHEAST AREA	170,698	62,555	63,526	166,222
21.11	Part of Los Angeles	59,927	24,830	25,579	59,323
21.12	Part of Los Angeles	34,771	11,053	11,130	33,618
21.13	Part of Los Angeles	39,329	15,891	16,001	37,655
21.14	Part of Los Angeles	36,671	10,781	10,816	35,626
22.0	NORWALK AREA	322,677	101,687	116,348	341,742
22.1	Unincorporated	355	83	83	352
22.2	Cerritos	15,856	4,623	12,639	41,897
22.3	Downey	88,573	31,494	33,571	88,180
22.4	Paramount	34,734	11,588	11,391	30,684
22.6	Norwalk	90,164	23,785	24,976	86,815
22.7	Bellflower	52,334	19,293	21,009	50,204
22.8	Artesia	14,757	4,018	4,501	15,511
22.10	Hawaiian Gardens	9,052	2,481	2,916	9,853
22.11	Part of Lakewood	16,852	4,322	5,262	18,246
23.0	PALOS VERDES AREA	184,898	59,719	68,028	197,771
23.1	Palos Verdes Estates	13,631	3,973	4,434	14,518
23.2	Part of Torrance	100,367	34,680	37,801	100,446
23.311	Unincorporated	29,433	7,770	873	2,229
23.312	Unincorporated	12,898	3,448	2,618	9,804
23.4	Rolling Hills	2,050	568	611	2,125
23.5	Rolling Hills Estates	6,735	1,766	2,335	8,447
23.6	Lomita	19,784	7,514	7,866	19,382
23.7	Rancho Palos Verdes (Incorp. 9/7/73)			11,498	40,820
24.0	PASADENA AREA	185,454	70,989	73,335	179,603
24.1	Pasadena	112,951	46,923	49,180	107,940
24.21	Unincorporated	20,714	6,141	6,279	20,918
24.22	Unincorporated	2,027	889	878	1,874
24.231	Unincorporated	42,415	14,331	14,315	41,816
24.232	Unincorporated	1,409	420	427	1,318
24.233	Unincorporated	5,938	2,285	2,256	5,737
25.0	POMONA AREA	149,654	46,616	51,951	155,147
25.1	Pomona	87,384	28,864	29,809	83,784
25.2	Claremont	23,998	6,788	7,475	25,200
25.3	La Verne	12,965	4,135	6,001	17,545
25.41	Unincorporated	1,064	278	280	1,015
25.42	Unincorporated	6,476	1,892	2,120	7,578
25.43	Unincorporated	2,075	284	303	2,068
25.5	San Dimas	15,692	4,375	5,963	17,957
26.0	PUENTE HILLS AREA	177,014	43,172	55,802	213,649
26.11	Unincorporated	21,452	4,713	4,769	21,004
26.121	Unincorporated	11,793	3,192	3,413	12,036
26.122	Unincorporated	37,794	9,270	12,267	46,429
26.131	Unincorporated	17,189	4,066	4,110	16,849
26.132	Unincorporated	12,386	2,703	3,012	13,160
26.141	Unincorporated	21,125	5,469	8,830	33,042
26.142	Unincorporated	13,303	3,338	5,642	21,207
26.3	La Puente	31,092	7,652	8,173	30,460
26.4	Part of Industry	684	147	148	652
26.5	Walnut	5,992	1,598	2,404	8,608
26.6	Part of West Covina	4,204	1,048	3,042	10,202
27.0	SAN FERNANDO AREA	215,516	58,794	63,023	219,612
27.1	San Fernando	16,571	5,559	5,524	15,240
27.21	Part of Los Angeles	40,349	11,182	11,836	41,349
27.22	Part of Los Angeles	60,275	16,195	19,104	67,118
27.23	Part of Los Angeles	32,671	8,714	9,015	31,032
27.24	Part of Los Angeles	65,658	17,144	17,544	64,873
28.0	SAN GABRIEL AREA	235,010	87,102	89,494	227,316
28.1	Alhambra	62,125	25,963	26,552	58,561
28.2	Monterey Park	49,166	16,337	16,918	49,563
28.3	San Gabriel	29,336	10,774	11,106	28,084
28.4	San Marino	14,177	4,630	4,640	13,459
28.5	South Pasadena	22,979	9,897	10,333	23,046
28.64	Unincorporated	17,203	6,592	6,762	15,484
28.65	Unincorporated	6,043	1,568	1,624	5,874
28.7	Part of Rosemead	26,821	8,539	8,722	26,276
28.8	Part of Temple City	7,160	2,802	2,837	6,969
29.0	SAN VICENTE-PALISADES AREA	44,126	14,744	15,751	43,704
29.11	Part of Los Angeles	7,803	2,713	2,965	7,777
29.12	Part of Los Angeles	13,268	4,019	4,155	13,118
29.13	Part of Los Angeles	23,055	8,012	8,631	22,809
30.0	SANTA MONICA-VENICE AREA	260,254	113,605	128,541	266,391
30.1	Santa Monica	88,289	42,106	46,308	88,609
30.21	Part of Los Angeles	41,872	21,602	23,574	41,814
30.22	Part of Los Angeles	58,814	23,214	25,864	59,774
30.231	Part of Los Angeles	27,467	8,864	9,737	27,449
30.232	Part of Los Angeles	36,146	15,466	17,004	37,078
30.32	Unincorporated	3,693	2,311	6,012	10,165
30.4	Unincorporated (Sawtelle Home)	3,973	42	42	1,502
31.0	SOUTH BAY AREA	182,904	68,174	75,004	182,175
31.1	El Segundo	15,620	5,994	6,155	14,880
31.2	Hermosa Beach	17,412	7,942	9,264	18,325
31.3	Manhattan Beach	35,352	13,127	13,473	32,794
31.4	Redondo Beach	57,451	20,251	24,900	63,309
31.51	Part of Los Angeles	49,903	17,684	17,990	46,384
31.52	Part of Los Angeles	4,260	1,784	1,755	3,846
31.61	Unincorporated	1,169	753	816	1,076
31.62	Unincorporated	1,737	639	651	1,561
32.0	SOUTHEAST AREA	447,656	161,766	160,982	418,692
32.1	Bell	21,836	9,052	9,246	21,751
32.2	Maywood	16,996	6,873	6,815	16,466
32.3	Huntington Park	33,744	15,725	15,340	32,327
32.4	Montebello	42,807	14,449	16,755	46,502
32.5	South Gate	56,909	23,541	23,892	52,707
32.6	Vernon	261	109	105	263
32.71	Part of Los Angeles	75,888	28,192	27,233	67,210
32.721	Part of Los Angeles	29,383	8,130	7,509	24,088
32.722	Part of Los Angeles	49,665	16,098	14,851	41,724
32.81	Unincorporated	262	108	106	255
32.82	Unincorporated	11,139	4,003	4,024	10,423
32.831	Unincorporated	24,606	7,932	7,762	24,504
32.832	Unincorporated	18,294	5,708	5,570	16,529
32.833	Unincorporated	8,925	3,704	3,693	8,737
32.84	Unincorporated	0	0	—	—
32.9	Commerce	10,635	3,131	3,075	10,197
32.10	Cudahy	16,998	5,459	5,461	16,818
32.11	Bell Gardens	29,308	9,552	9,545	28,191
33.0	TUJUNGA AREA	53,630	17,270	17,368	51,528
33.1	Part of Los Angeles	53,630	17,270	17,368	51,528
34.0	WHITTIER AREA	269,173	78,470	83,275	267,884
34.1	Part of Whittier	72,863	25,817	27,173	70,961
34.21	Unincorporated	2,283	553	706	2,775
34.22	Unincorporated	20,845	6,154	6,218	19,545
34.23	Unincorporated	4,695	1,388	1,515	4,837
34.241	Unincorporated	43,008	11,766	12,475	43,497
34.242	Unincorporated	12,339	3,333	3,102	11,293
34.25	Unincorporated	13,384	3,228	1,762	7,182
34.31	Part of Santa Fe Springs	6,939	1,728	2,193	8,247
34.32	Part of Santa Fe Springs	7,811	2,036	2,130	7,579
34.4	Pico Rivera	54,170	14,647	15,222	51,390
34.5	La Mirada	30,808	7,811	10,770	40,550
34.6	Part of Industry	28	9	9	28
35.0	WILSHIRE AREA	172,424	89,431	94,987	161,682
35.11	Part of Los Angeles	37,150	19,442	20,266	33,378
35.12	Part of Los Angeles	37,566	22,387	25,969	37,630
35.13	Part of Los Angeles	51,207	26,657	27,627	49,107
35.14	Part of Los Angeles	46,501	20,943	21,123	41,567
35.2	Unincorporated	0	2	2	0

LOS ANGELES COUNTY HOUSING TRENDS* NET CHANGES COMPARED JULY THROUGH DECEMBER

	Housing Units 1975	Housing Units 1974	Change From Year Ago Number	Change From Year Ago Percent
Single Units**	2,924	1,951	973	49.9
Multiple Units	6,782	7,776	—994	—12.8
Total Units	9,706	9,727	—21	—0.2

*These figures are compiled from a survey of residential new construction, move-ins, removals, demolitions and alterations reported by each of the permit issuing agencies in Los Angeles County. Housing unit changes are entered in the housing inventory either upon completion or after an assumed completion date.

**Includes single units, duplex units and mobile homes.

HOUSING *(Continued from page 1)*

taled 6,782. This was a slight gain of 123 units over the number added in the previous six months, but 994 units or 12.8 percent below those added in the same period of the previous year.

Single units accounted for 30 percent of the net units added in the second half as compared with 15 percent in the first six months. While this resurgence of single family home construction may foreshadow the beginning of a trend, the major finding which emerges from a review of the 1975 housing records is that 77 percent of the net units added were in multiple structures. The overwhelming character and longevity of this dominance is clearly shown in the bar graph on page 1. The April 1976 issue will contain a more complete review of the housing changes in 1975.

POPULATION *(Continued from page 1)*

tially a horizontal trend line centered upon a total population of 7,000,000.

Generally, population changes within the County continued to follow the long established pattern of gains in the outlying suburban areas and losses or little change in the central urban districts. For example, twelve of the thirteen Major Statistical Areas and twenty-two of the thirty cities which registered population increases in 1975 are located in the suburbs. Population changes in the unincorporated areas also reflected this pattern, increasing approximately 10,300 to a January 1, 1976 total of 1,021,500. At the same time, those living in cities declined approximately 36,300 to a total of 5,973,200.

A review of the 1975 population changes within a fifteen mile radius of downtown Los Angeles shows that this central urban area lost approximately 38,000 inhabitants. However, not all cities and unincorporated places within this radius experienced losses. In fact, in the southeastern quadrant of this radius, a counter trend may be emerging.

A notable example is the Compton Area (MSA 8.0), an area which has been in continuous decline since the 1970 Census, losing an estimated 17,800 residents in this period. However, in 1975, the decline was halted and the Compton Area experienced a small net gain.

Some other older urban areas have also experienced a steady decline in housing vacancies which suggests that similar turnarounds have or are about to occur. However, there is not yet sufficient corroborative evidence to determine whether these declining vacancies foreshadow a reversal of past trends or merely reflect short-term local conditions.

CENSUS TRACTS UNDER REVIEW PART OF 1980 CENSUS PREPARATIONS

A review of Los Angeles County census tracts has begun in preparation for their use in the 1980 Census. No major changes are contemplated in the overall tract design. However, some of the existing 1,576 census tracts now have populations in excess of 8,000 and physical changes have occurred which require a re-examination of the boundaries of several others.

A preliminary survey indicates that, in updating the Los Angeles County Census Tract Plan for the 1980 Census, thirty to forty census tracts may be divided and perhaps as many minor boundary adjustments made. Although some changes will be necessary, every effort will be made to preserve the integrity of the existing boundaries so that comparability of the 1980 census tract data with that of earlier censuses will not be impaired.

The original numbering plan of one to three digits with an alphabetical suffix was replaced in 1960 by a four digit system, which in turn was expanded to six digits in 1970. No basic change in the existing numbering system for the 1980 Census is anticipated.

POPULATION AND HOUSING TABLE NOTES

Housing unit adjustments contained in this issue include the following:

Statistical Area No.	Jurisdiction	Housing Units Single	Mobile Homes	Multiple	*
14.1	Glendale	5			(2)
		—96			(1)
18.1	Arcadia	12			(2)
18.42		—12			(3)
20.2	Palmdale	1	39	4	(2)
20.121	Unincorporated	—1	—39	—4	(3)
24.21	Unincorporated	—5			(3)
25.2	Claremont	11			(2)
25.42	Unincorporated	—11			(3)

*Reason adjusted: (1) Demolitions in redevelopment area; (2) Annexation; (3) Annexed to adjacent city.

Adjustments were made in the population estimates of the following cities in order to recognize the results of recent special censuses: Pasadena (SA 24.1), Claremont (SA 25.2) Carson (SA's 8.4, 10.213, 10.31 and 10.32), and Pico Rivera (SA 34.4). The housing counts for these cities will be adjusted in the July 1976 issue.

EDITOR'S NOTE

During the past seventeen years, Laura Mowrey has worked in or been in charge of the unit responsible for updating the housing inventory. In this capacity, she has initiated or supervised the implementation of many changes which have improved the quality and widened the scope of this file.

The housing estimates in this and the April issues are the last to be compiled under her supervision. Now retired, she has left us a valuable legacy in the procedures, techniques, and qualitative standards she established.

Two other changes also should be noted. Both Richard Kawasaki, Assistant Section Head, and Pamela Holt have been transferred to other departmental functions. while Bill Dunlap, Patricia Emmons and Marcelle Mehlinger have joined Faye Howard on the staff.

STATISTICAL AREAS
COUNTY OF LOS ANGELES
MAJOR STATISTICAL AREAS - CITY BOUNDARIES
MAJOR STATISTICAL AREAS - CENSUS TRACT BOUNDARIES
STATISTICAL AREAS - CITY BOUNDARIES
STATISTICAL AREAS - CENSUS TRACT BOUNDARIES
25.42 STATISTICAL AREAS NUMBER
SCALE IN MILES
COUNTY OF LOS ANGELES DEPARTMENT OF REGIONAL PLANNING
SAN BERNARDINO COUNTY
KERN COUNTY
VENTURA COUNTY
NORTHERN PART OF LOS ANGELES COUNTY
PACIFIC OCEAN

APPENDIX C

Principles of the Mineral Resources Classification System of the U.S. Bureau of Mines and the U.S. Geological Survey (From U.S. Geological Survey Bulletin 1450A)

Principles of the Mineral Resource Classification System of the U.S. Bureau of Mines and U.S. Geological Survey

MINERAL RESOURCE CLASSIFICATION SYSTEMS OF THE U.S. BUREAU OF MINES AND U.S. GEOLOGICAL SURVEY

GEOLOGICAL SURVEY BULLETIN 1450–A

A report published jointly by the U.S. Bureau of Mines and U.S. Geological Survey

Definitions of mineral resource classification terms used by the U.S. Bureau of Mines and U.S. Geological Survey

UNITED STATES DEPARTMENT OF THE INTERIOR

THOMAS S. KLEPPE, *Secretary*

GEOLOGICAL SURVEY

V. E. McKelvey, *Director*

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PRINCIPLES OF THE MINERAL RESOURCES CLASSIFICATION SYSTEM OF THE U.S. BUREAU OF MINES AND U.S. GEOLOGICAL SURVEY

GENERAL DEFINITION OF MINERAL AND ENERGY RESOURCES

The dictionary definition of resource "something in reserve or ready if needed" has been extended for mineral and energy resources to comprise all materials surmised to exist having present or future values. In geologic terms a mineral or energy resource is a concentration of naturally occurring solid, liquid, or gaseous materials in or on the Earth's crust in such form that economic extraction of a commodity is currently or potentially feasible. Material classified as a reserve is that portion of an identified resource producible at a profit at the time of classification.

Total Resources are materials that have present or future value and comprise identified or known materials plus those not yet identified, but which on the basis of geologic evidence are presumed to exist.

PHILOSOPHIC BASIS FOR A RESOURCE CLASSIFICATION

Public attention usually is focused on current economic availability of mineral or energy materials (reserves). Long-term public and commercial planning, however, must be based on the probability of geologic identification of resources in as yet undiscovered deposits and of technologic development of economic extraction processes for presently unworkable deposits. Thus, all the components of Total Resources must be continuously reassessed in the light of new geologic knowledge, of progress in science, and of shifts in economic and political conditions.

Another requirement of long-term planning is the weighing of total or multi-commodity resource availability against a particular need. To achieve this the general classification system must be uniformly applicable to all commodities so that data for alternate or substitute commodities can be compared.

To serve these planning purposes Total Resoures are classified both in terms of economic feasibility and of the degree of geologic assurance. The factors involved are incorporated in figure 1 to provide a graphic classification of Total Resources.

General guides for the use of this classification system are as follows:

1. Resource categories and definitions in the classification, as specified in the glossary, should be applicable to all naturally occurring concentrations of metals, nonmetals, and fossil fuels. The categories may be subdivided for special purposes.
2. Definitions may be amplified, where necessary, to make them more precise and conformable with accepted usage for particular commodities or types of resource evaluations.
3. Quantities and qualities may be expressed in a variety of terms and units to suit different purposes, but must be clearly stated and defined.

GLOSSARY OF RESOURCE TERMS

Resource.—A concentration of naturally occurring solid, liquid, or gaseous materials in or on the Earth's crust in such form that economic extraction of a commodity is currently or potentially feasible.

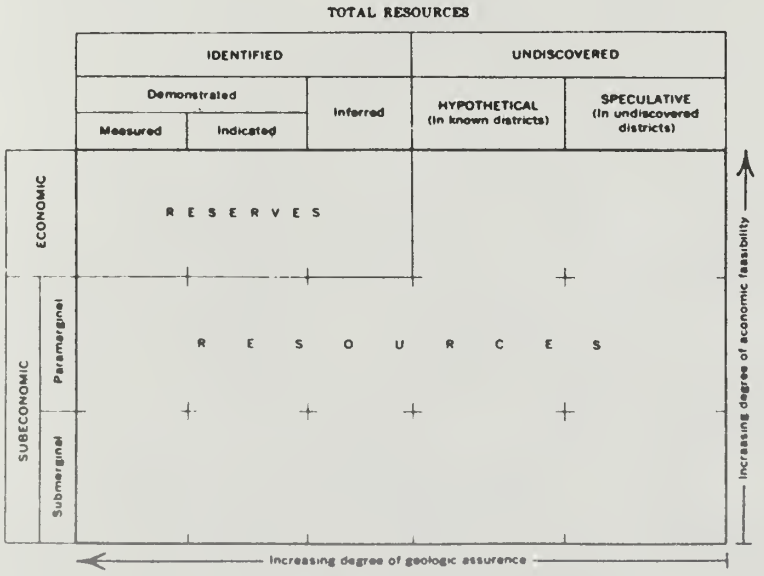

FIGURE 1.—Classification of mineral resources.

Identified resources.—Specific bodies of mineral-bearing material whose location, quality, and quantity are known from geologic evidence supported by engineering measurements with respect to the demonstrated category.

Undiscovered resources.—Unspecified bodies of mineral-bearing material surmised to exist on the basis of broad geologic knowledge and theory.

Reserve.—That portion of the identified resource from which a usable mineral and energy commodity can be economically and legally extracted at the time of determination. The term *ore* is used for reserves of some minerals.

The following definitions for measured, indicated, and inferred are applicable to both the Reserve and Identified-Subeconomic resource components.[1]

Measured.—Reserves or resources for which tonnage is computed from dimensions revealed in outcrops, trenches, workings, and drill holes and for which the grade is computed from the results of detailed sampling. The sites for inspection, sampling, and measurement are spaced so closely and the geologic character is so well defined that size, shape, and mineral content are well established. The computed tonnage and grade are judged to be accurate within limits which are stated, and no such limit is judged to be different from the computed tonnage or grade by more than 20 percent.

Indicated.—Reserves or resources for which tonnage and grade are computed partly from specific measurements, samples, or production data and partly from projection for a reasonable distance on geologic evidence. The sites available for inspection, measurement, and sampling are too widely or otherwise inappropriately spaced to permit the mineral bodies to be outlined completely or the grade established throughout.

Demonstrated.—A collective term for the sum of measured and indicated reserves or resources.

Inferred.—Reserves or resources for which quantitative estimates are based largely on broad knowledge of the geologic charac-

[1] The terms proved, probable, and possible (used by the industry and economic evaluations of ore in specific deposits or districts) commonly have been used loosely and interchangeably with the terms measured, indicated, or inferred (used by the Department of the Interior mainly for regional or national estimates). The terms "proved" and "measured" are essentially synonymous. The terms "probable" and "possible," however, are not synonymous with "indicated" and "inferred." "Probable" and "possible" describe estimates of partly sampled deposits—in some definitions, for example, "probable" is used to describe deposits sampled on two or three sides, and "possible" for deposits sampled only on one side; in the Bureau-Survey definitions, both would be described by the term "indicated."

ter of the deposit and for which there are few, if any, samples or measurements. The estimates are based on an assumed continuity or repetition, of which there is geologic evidence; this evidence may include comparison with deposits of similar type. Bodies that are completely concealed may be included if there is specific geologic evidence of their presence. Estimates of inferred reserves or resources should include a statement of the specific limits within which the inferred material may lie.

Identified-Subeconomic.—Resources that are not Reserves, but may become so as a result of changes in economic and legal conditions.

Paramarginal.—The portion of Subeconomic Resources that (1) borders on being economically producible or (2) is not commercially available solely because of legal or political circumstances.

Submarginal.—The portion of Subeconomic Resources which would require a substantially higher price (more than 1.5 times the price at the time of determination) or a major cost-reducing advance in technology.

Hypothetical resources.—Undiscovered resources that may reasonably be expected to exist in a known mining district under known geologic conditions. Exploration that confirms their existence and reveals quantity and quality will permit their reclassification as a Reserve or Identified-Subeconomic resource.

Speculative resources.—Undisovered resources that may occur either in known types of deposits in a favorable geologic setting where no discoveries have been made, or in as yet unknown types of deposits that remain to be recognized. Exploration that confirms their existence and reveals quantity and quality will permit their reclassification as Reserves or Identified-Subeconomic resources.

AREAS OF RESPONSIBILITY AND OPERATIONAL PROCEDURES

U.S. Bureau of Mines.—The Bureau appraises, analyzes, and publishes reserve estimates from base data supplied by the mineral and energy materials industry, the U.S. Geological Survey, and other governmental agencies. The Bureau judges commodity recoverability on existing economic and legal factors.

U.S. Geological Survey.—The Survey appraises, analyzes, and publishes estimates of Total Resources. It reports such measurable parameters of significance to resource evaluation as location, quality, quantity, and situation of Identified resources.

Annual Resource Summation.—The U.S. Bureau of Mines and U.S. Geological Survey will confer and agree annually on estimates in all of the resource categories defined above. These data will be in Bureau or Survey publications and will be available for inclusion in the Secretary's Annual Report required by the Mining and Minerals Policy Act of 1970.

Ad Hoc Joint Conferences.—The Directors will convene ad hoc joint work groups to resolve problems in the resource area.

CALIFORNIA DIVISION OF MINES AND GEOLOGY
JAMES F. DAVIS, STATE GEOLOGIST

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF CONSERVATION

MATILIJA QUADRANGLE
SPECIAL REPORT 145 PLATE 1.1

MRZ-3
MRZ-4
MRZ-3 (a)
MRZ-3
MRZ-4
MRZ-1
NATIONAL FOREST BDY
WESTERN VENTURA CO P-C REGION BDY
MRZ-4
MRZ-1
MRZ-4
MRZ-3 (a)
MRZ-3 (a)
MRZ-4
MRZ-4
MRZ-1
MRZ-3
MRZ-3
MRZ-4
MRZ-4
MRZ-1
MRZ-3 (a)
MRZ-3 (a)
MRZ-1
MRZ-1
MRZ-4
MRZ-3
MRZ-1
MRZ-3

TOPOGRAPHIC BASE MAP BY U.S. GEOLOGICAL SURVEY
Reduced from 1:24,000

EXPLANATION

Drill hole

OUTER BOUNDARY OF AREAS SUBJECT TO URBANIZATION
Boundaries established from data supplied by the Office of Planning and Research with modifications developed from information supplied by local government and other sources. Hachures lie within area undergoing urbanization.

EXISTING URBAN BOUNDARIES
Boundaries established by the Office of Planning and Research and by data supplied by local government agencies and other sources to reflect present conditions. Hachures lie within urban area.

PRODUCTION-CONSUMPTION REGION BOUNDARY
(see text for discussion)

MINERAL RESOURCE ZONE BOUNDARIES

MRZ-2

- MRZ-1 Areas where adequate information indicates that no significant mineral deposits are present, or where it is judged that little likelihood exists for their presence.
- MRZ-2 Areas where adequate information indicates that significant mineral deposits are present or where it is judged that a high likelihood for their presence exists.
- MRZ-3 Areas containing mineral deposits the significance of which cannot be evaluated from available data.
- MRZ-4 Areas where available information is inadequate for assignment to any other MRZ zone.

See text for additional explanation of MRZ Symbols.

CONTOUR INTERVAL 40 FEET
DOTTED LINES REPRESENT HALF INTERVAL CONTOURS
DATUM IS MEAN SEA LEVEL

MATILIJA, CALIF.

MINERAL LAND CLASSIFICATION MAP
AGGREGATE RESOURCES ONLY

PREPARED IN COMPLIANCE WITH THE SURFACE MINING AND RECLAMATION ACT OF 1975, ARTICLE 4, SECTION 2761

James F. Davis
STATE GEOLOGIST AUGUST 21, 1981

CALIFORNIA DIVISION OF MINES AND GEOLOGY
JAMES F. DAVIS, STATE GEOLOGIST

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF CONSERVATION

OJAI QUADRANGLE

SPECIAL REPORT 145 PLATE I.2

TOPOGRAPHIC BASE MAP BY U.S. GEOLOGICAL SURVEY
Reduced from 1:24,000

CONTOUR INTERVAL 40 FEET
DOTTED LINES REPRESENT 20-FOOT CONTOURS
DATUM IS MEAN SEA LEVEL

OJAI, CALIF

EXPLANATION

Drill hole

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MINERAL LAND CLASSIFICATION MAP

AGGREGATE RESOURCES ONLY

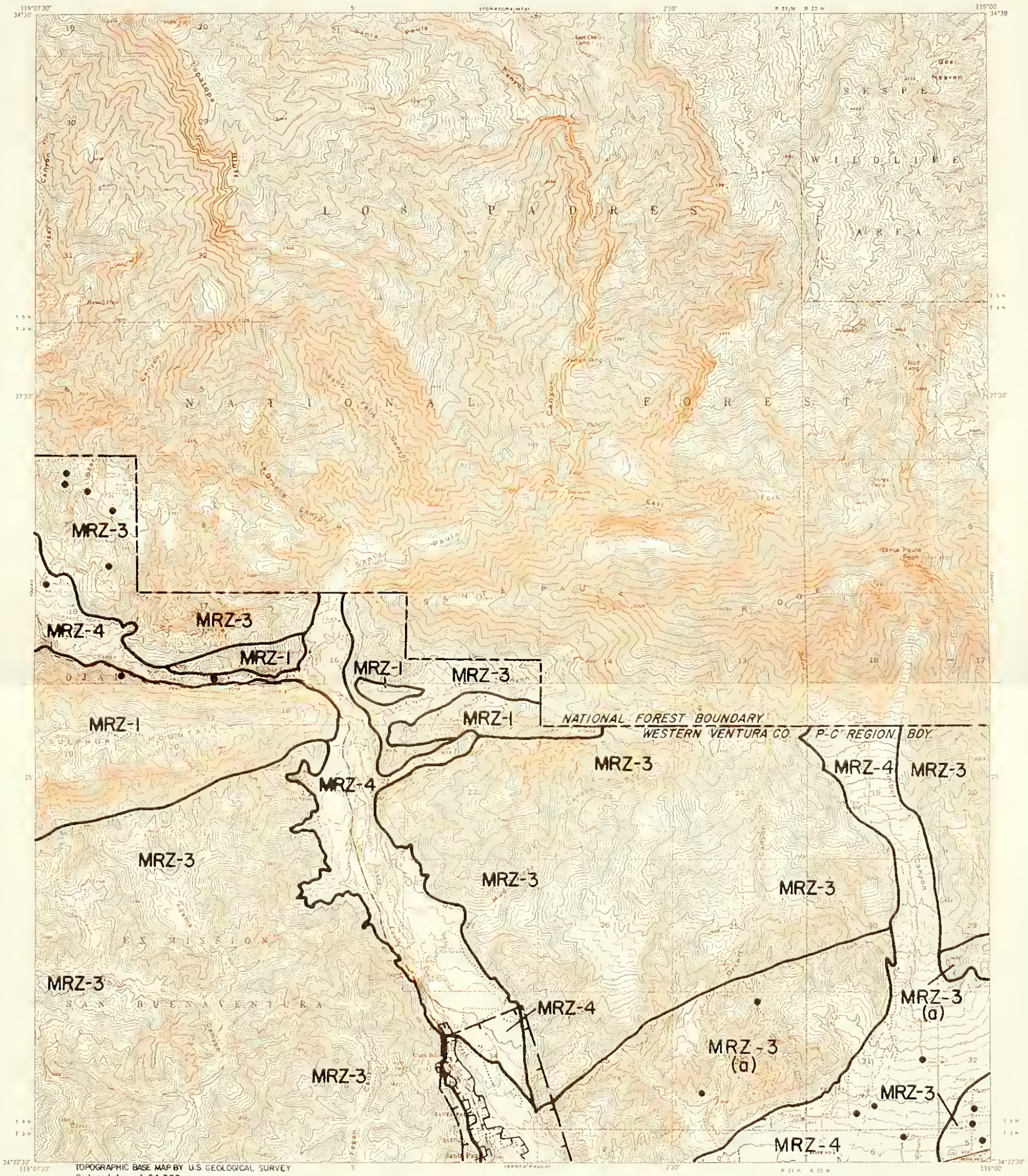
PREPARED IN COMPLIANCE WITH THE SURFACE MINING AND RECLAMATION ACT OF 1975, ARTICLE 4, SECTION 2761

James F. Davis
STATE GEOLOGIST AUGUST 21, 1981

CALIFORNIA DIVISION OF MINES AND GEOLOGY
JAMES F. DAVIS, STATE GEOLOGIST

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF CONSERVATION

SANTA PAULA PEAK QUADRANGLE
SPECIAL REPORT 145 PLATE 1.3



TOPOGRAPHIC BASE MAP BY U.S. GEOLOGICAL SURVEY
Reduced from 1:24,000

EXPLANATION

- Drill hole
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CONTOUR INTERVAL 40 FEET
DATUM IS MEAN SEA LEVEL

SANTA PAULA PEAK, CALIF.

REVISED VERSION
SUPERCEDES MAP DATED
AUGUST 21, 1981

MINERAL LAND CLASSIFICATION MAP
AGGREGATE RESOURCES ONLY

PREPARED IN COMPLIANCE WITH THE SURFACE MINING AND RECLAMATION ACT OF 1975, ARTICLE 4, SECTION 2761

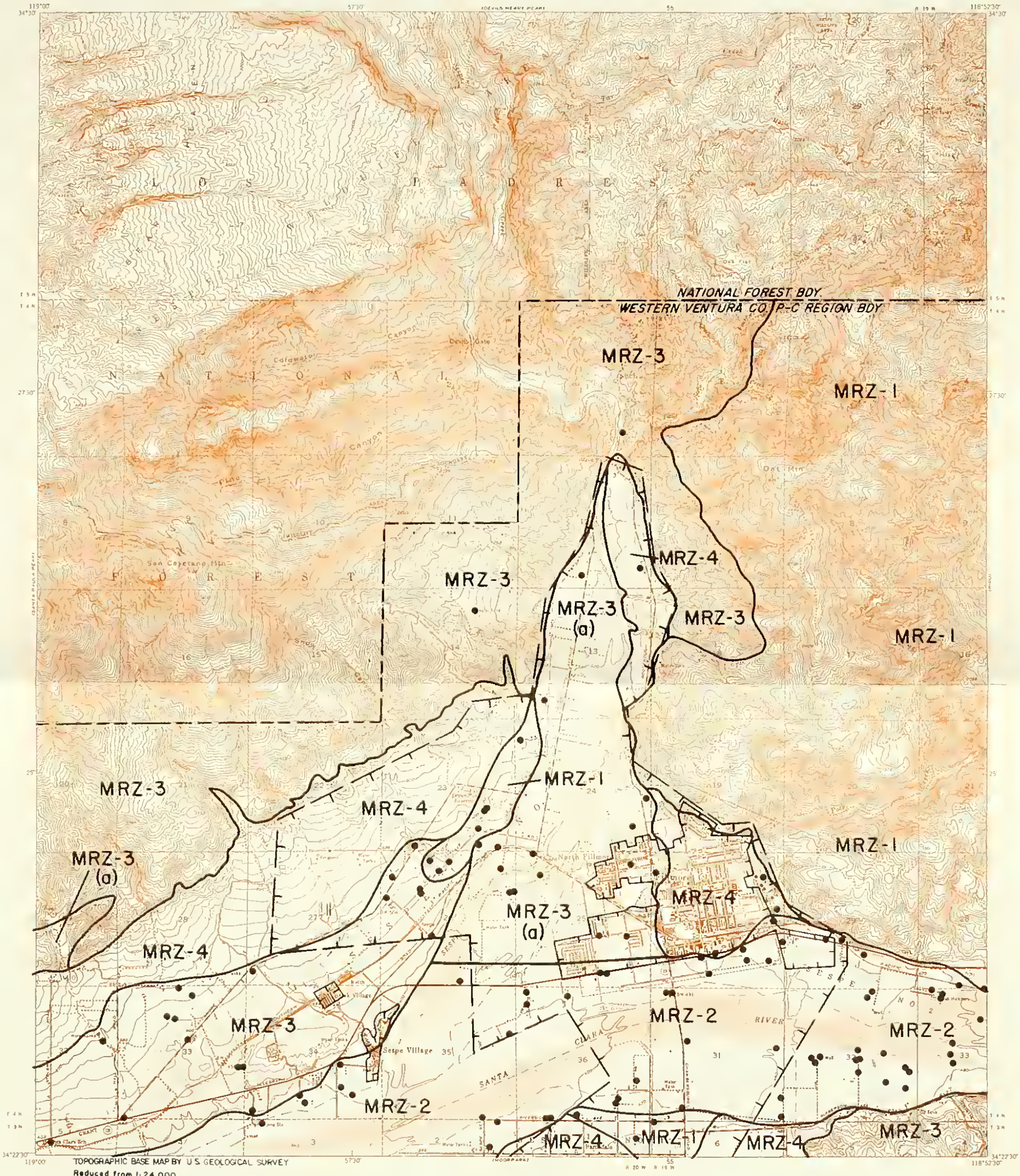
James F. Davis
STATE GEOLOGIST AUGUST 21, 1981

CALIFORNIA DIVISION OF MINES AND GEOLOGY
JAMES F. DAVIS, STATE GEOLOGIST

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF CONSERVATION

FILLMORE QUADRANGLE

SPECIAL REPORT 145 PLATE 14



EXPLANATION

- Drill hole

OUTER BOUNDARY OF AREAS SUBJECT TO URBANIZATION
Boundaries established from data supplied by the Office of Planning and Research with modifications developed from information supplied by local government and other sources. Hachures lie within area undergoing urbanization.

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REVISED VERSION
SUPERCEDES MAP DATED
AUGUST 21, 1981

MINERAL LAND CLASSIFICATION MAP

AGGREGATE RESOURCES ONLY

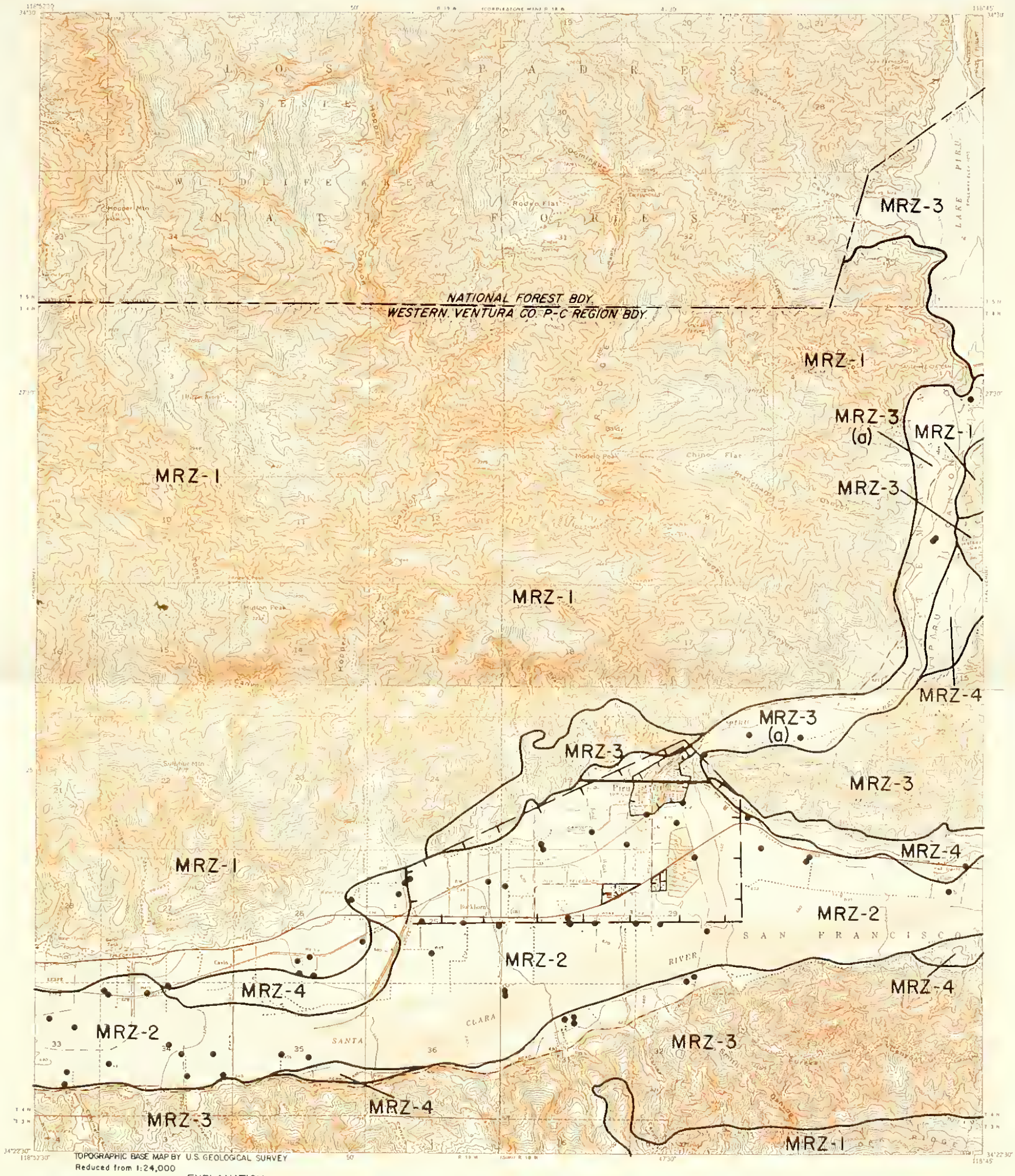
PREPARED IN COMPLIANCE WITH THE SURFACE MINING AND RECLAMATION ACT OF 1975, ARTICLE 4, SECTION 2761

James F. Davis
STATE GEOLOGIST AUGUST 21, 1981

CALIFORNIA DIVISION OF MINES AND GEOLOGY
JAMES F. DAVIS, STATE GEOLOGIST

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF CONSERVATION

PIRU QUADRANGLE
SPECIAL REPORT 145 PLATE 1.5



TOPOGRAPHIC BASE MAP BY U.S. GEOLOGICAL SURVEY
Reduced from 1:24,000

EXPLANATION

- Drill hole
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CONTOUR INTERVAL 40 FEET
DOTTED LINES REPRESENT 10-FOOT CONTOURS
DATUM IS MEAN SEA LEVEL

PIRU, CALIF.

REVISED VERSION
SUPERCEDES MAP DATED
AUGUST 21, 1981

MINERAL LAND CLASSIFICATION MAP
AGGREGATE RESOURCES ONLY

PREPARED IN COMPLIANCE WITH THE SURFACE MINING AND RECLAMATION ACT OF 1975, ARTICLE 4, SECTION 2761

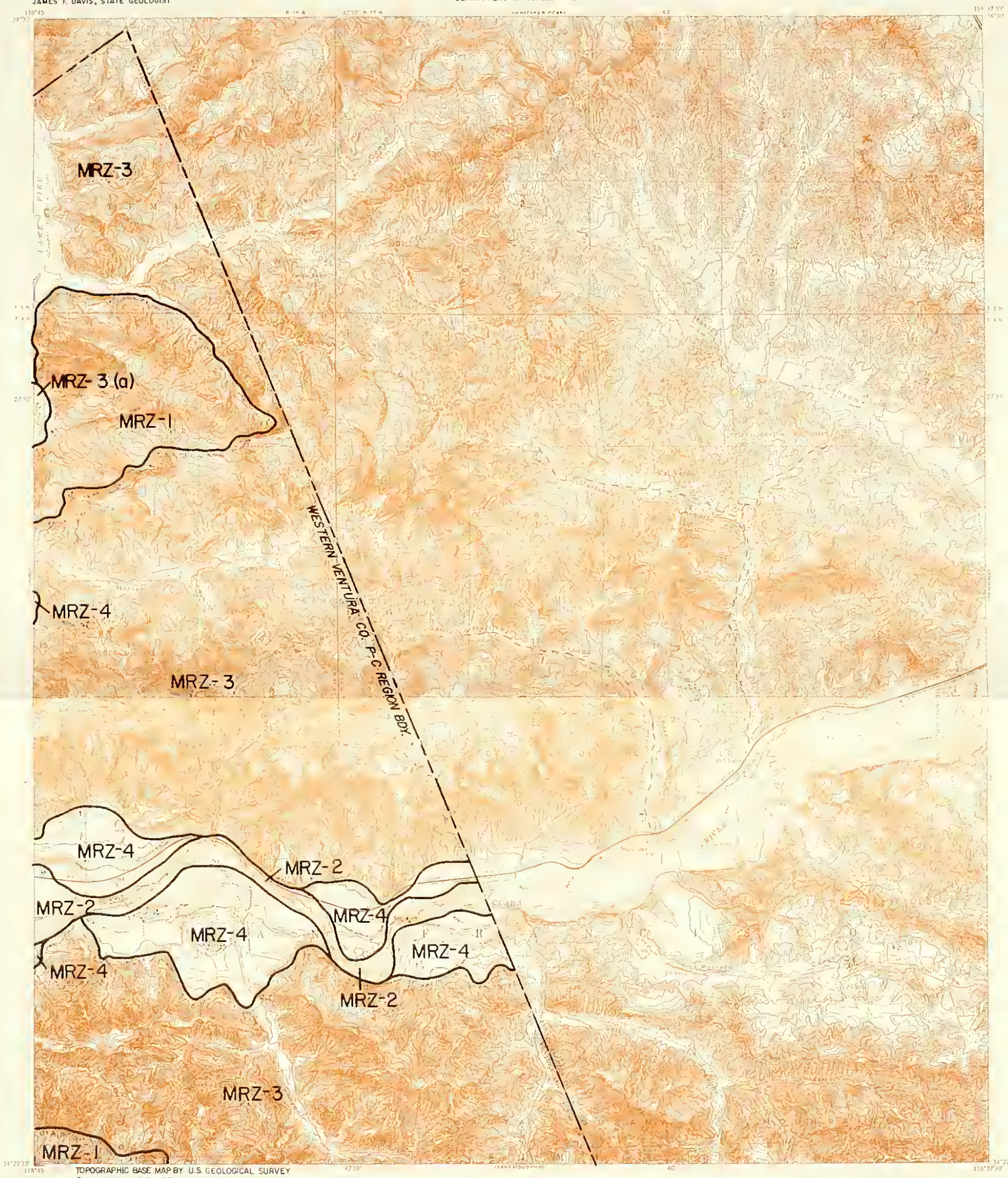
James F. Davis
STATE GEOLOGIST AUGUST 21, 1981

CALIFORNIA DIVISION OF MINES AND GEOLOGY
JAMES F. DAVIS, STATE GEOLOGIST

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF CONSERVATION

VAL VERDE QUADRANGLE

SPECIAL REPORT 145 PLATE 1.6



TOPOGRAPHIC BASE MAP BY U.S. GEOLOGICAL SURVEY
Reduced from 1:24,000

EXPLANATION

Drill hole

OUTER BOUNDARY OF AREAS SUBJECT TO URBANIZATION
Boundaries established from data supplied by the Office of Planning and Research with modifications developed from information supplied by local government and other sources. Hachures lie within area undergoing urbanization.

EXISTING URBAN BOUNDARIES
Boundaries established by the Office of Planning and Research and by data supplied by local government agencies and other sources to reflect present conditions. Hachures lie within urban area.

PRODUCTION-CONSUMPTION REGION BOUNDARY
(see text for discussion)

MINERAL RESOURCE ZONE BOUNDARIES

MRZ-2

- MRZ-1 Areas where adequate information indicates that no significant mineral deposits are present, or where it is judged that little likelihood exists for their presence.
- MRZ-2 Areas where adequate information indicates that significant mineral deposits are present or where it is judged that a high likelihood for their presence exists.
- MRZ-3 Areas containing mineral deposits the significance of which cannot be evaluated from available data.
- MRZ-4 Areas where available information is inadequate for assignment to any other MRZ zone.

See text for additional explanation of MRZ Symbols.

CONTOUR INTERVAL 25 FEET
DOTTED LINES REPRESENT 5-FOOT CONTOURS
DATUM IS MEAN SEA LEVEL

VAL VERDE, CALIF.

MINERAL LAND CLASSIFICATION MAP
AGGREGATE RESOURCES ONLY

PREPARED IN COMPLIANCE WITH THE SURFACE MINING AND RECLAMATION ACT OF 1975, ARTICLE 4, SECTION 2761

James F. Davis
STATE GEOLOGIST AUGUST 21, 1981

CALIFORNIA DIVISION OF MINES AND GEOLOGY
JAMES F. DAVIS, STATE GEOLOGIST

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF CONSERVATION

PITAS POINT QUADRANGLE
SPECIAL REPORT 145 PLATE 1.7

TOPOGRAPHIC BASE MAP BY U.S. GEOLOGICAL SURVEY
Reduced from 1:24,000

EXPLANATION

- Drill hole

OUTER BOUNDARY OF AREAS SUBJECT TO URBANIZATION
Boundaries established from data supplied by the Office of Planning and Research with modifications developed from information supplied by local government and other sources. Hachures lie within area undergoing urbanization.

EXISTING URBAN BOUNDARIES
Boundaries established by the Office of Planning and Research and by data supplied by local government agencies and other sources to reflect present conditions. Hachures lie within urban area.

PRODUCTION-CONSUMPTION REGION BOUNDARY
(see text for discussion)

MINERAL RESOURCE ZONE BOUNDARIES

MRZ-2

- MRZ-1 Areas where adequate information indicates that no significant mineral deposits are present, or where it is judged that little likelihood exists for their presence.
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- MRZ-4 Areas where available information is inadequate for assignment to any other MRZ zone.

See text for additional explanation of MRZ Symbols.

CONTOUR INTERVAL 20 FEET
DATUM IS MEAN SEA LEVEL

PITAS POINT, CALIF.

MINERAL LAND CLASSIFICATION MAP
AGGREGATE RESOURCES ONLY

PREPARED IN COMPLIANCE WITH THE SURFACE MINING AND RECLAMATION ACT OF 1975, ARTICLE 4, SECTION 2761

James F. Davis
STATE GEOLOGIST AUGUST 21, 1981

CALIFORNIA DIVISION OF MINES AND GEOLOGY
JAMES F. DAVIS, STATE GEOLOGIST

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF CONSERVATION

VENTURA QUADRANGLE
SPECIAL REPORT 145 PLATE 1.8

TOPOGRAPHIC BASE MAP BY U.S. GEOLOGICAL SURVEY
Reduced from 1:24,000

EXPLANATION

● Drill hole

OUTER BOUNDARY OF AREAS SUBJECT TO URBANIZATION
Boundaries established from data supplied by the Office of Planning and Research with modifications developed from information supplied by local government and other sources. Hachures lie within area undergoing urbanization.

No. 2
EXISTING URBAN BOUNDARIES
Boundaries established by the Office of Planning and Research and by data supplied by local government agencies and other sources to reflect present conditions. Hachures lie within urban area.

No 3
PRODUCTION-CONSUMPTION REGION BOUNDARY
(see text for discussion)

MINERAL RESOURCE ZONE BOUNDARIES

MRZ-2

- MRZ-1 Areas where adequate information indicates that no significant mineral deposits are present, or where it is judged that little likelihood exists for their presence.
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- MRZ-3 Areas containing mineral deposits the significance of which cannot be evaluated from available data.
- MRZ-4 Areas where available information is inadequate for assignment to any other MRZ zone.

See text for additional explanation of MRZ Symbols.

REVISED VERSION
SUPERCEDES MAP DATED
AUGUST 21,1981

VENTURA CALIF.

MINERAL LAND CLASSIFICATION MAP

AGGREGATE RESOURCES ONLY

PREPARED IN COMPLIANCE WITH THE SURFACE MINING AND RECLAMATION ACT OF 1975, ARTICLE 4, SECTION 2761

James F. Davis
STATE GEOLOGIST AUGUST 21,1981

CALIFORNIA DIVISION OF MINES AND GEOLOGY
JAMES F DAVIS, STATE GEOLOGIST

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF CONSERVATION

SATICOY QUADRANGLE
SPECIAL REPORT 145 PLATE 1.9

EXPLANATION

- Drill hole
- OUTER BOUNDARY OF AREAS SUBJECT TO URBANIZATION
  Boundaries established from data supplied by the Office of Planning and Research with modifications developed from information supplied by local government and other sources. Hachures lie within area undergoing urbanization.
- EXISTING URBAN BOUNDARIES
  Boundaries established by the Office of Planning and Research and by data supplied by local government agencies and other sources to reflect present conditions. Hachures lie within urban area.
- PRODUCTION-CONSUMPTION REGION BOUNDARY
  (see text for discussion)

MINERAL RESOURCE ZONE BOUNDARIES

MRZ-2

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See text for additional explanation of MRZ Symbols.

SATICOY, CALIF

MINERAL LAND CLASSIFICATION MAP

AGGREGATE RESOURCES ONLY

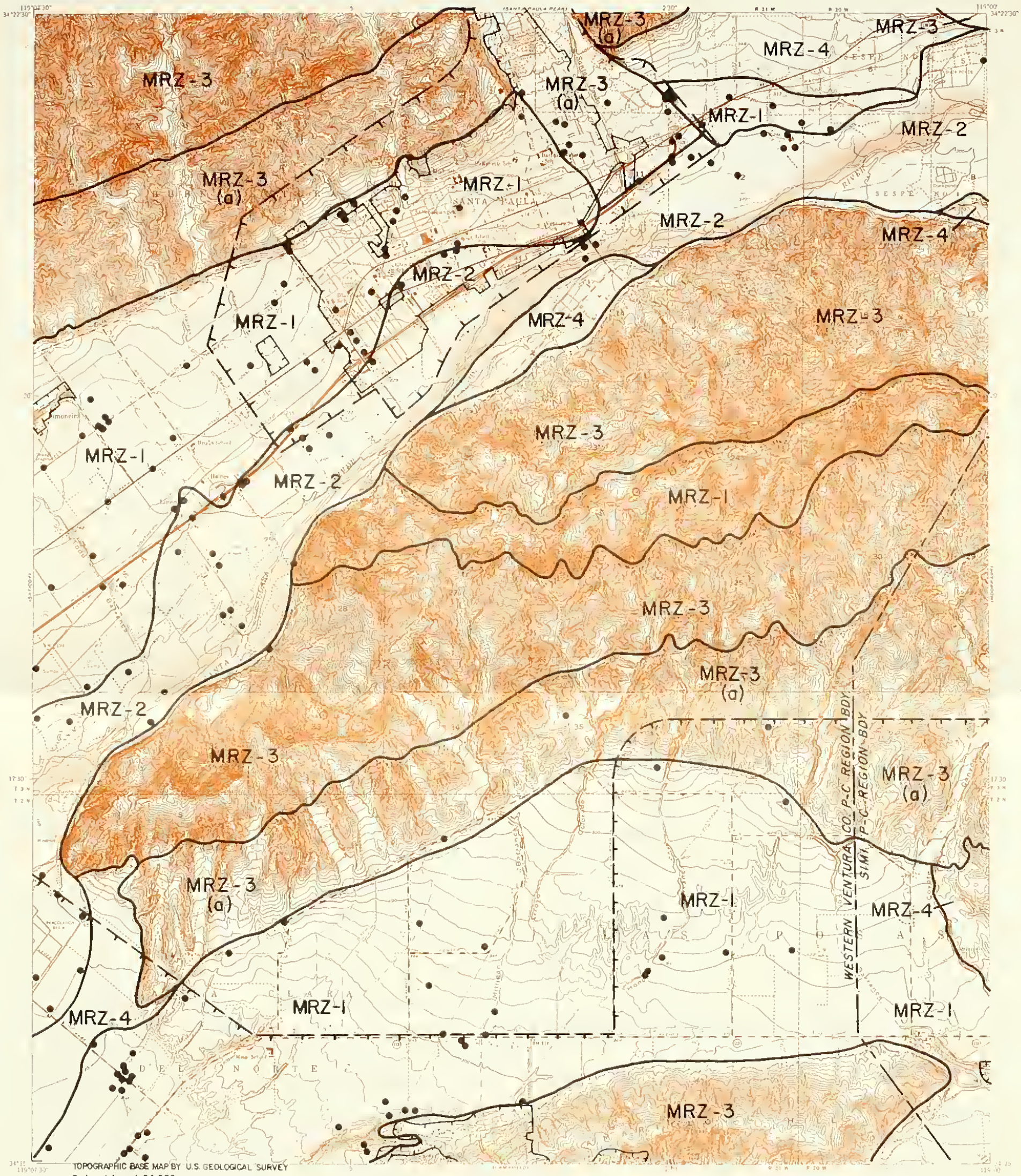
PREPARED IN COMPLIANCE WITH THE SURFACE MINING AND RECLAMATION ACT OF 1975, ARTICLE 4, SECTION 2761

James F. Davis
STATE GEOLOGIST AUGUST 21, 1981

CALIFORNIA DIVISION OF MINES AND GEOLOGY
JAMES F. DAVIS, STATE GEOLOGIST

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF CONSERVATION

SANTA PAULA QUADRANGLE
SPECIAL REPORT 145 PLATE 1.10



EXPLANATION

- Drill hole
- OUTER BOUNDARY OF AREAS SUBJECT TO URBANIZATION
  Boundaries established from data supplied by the Office of Planning and Research with modifications developed from information supplied by local government and other sources. Hachures lie within area undergoing urbanization.
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- PRODUCTION-CONSUMPTION REGION BOUNDARY
  (see text for discussion)

MINERAL RESOURCE ZONE BOUNDARIES

MRZ-2

- MRZ-1 Areas where adequate information indicates that no significant mineral deposits are present, or where it is judged that little likelihood exists for their presence.
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See text for additional explanation of MRZ Symbols.

REVISED VERSION
SUPERCEDES MAP DATED
AUGUST 21,1981

MINERAL LAND CLASSIFICATION MAP

AGGREGATE RESOURCES ONLY

PREPARED IN COMPLIANCE WITH THE SURFACE MINING AND RECLAMATION ACT OF 1975, ARTICLE 4, SECTION 2761

James F. Davis
STATE GEOLOGIST AUGUST 21,1981

SANTA PAULA, CALIF.

CALIFORNIA DIVISION OF MINES AND GEOLOGY
JAMES F. DAVIS, STATE GEOLOGIST

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF CONSERVATION

TOPOGRAPHIC BASE MAP BY U.S. GEOLOGICAL SURVEY
Reduced from 1:24,000

EXPLANATION

- Drill hole

OUTER BOUNDARY OF AREAS SUBJECT TO URBANIZATION
Boundaries established from data supplied by the Office of Planning and Research with modifications developed from information supplied by local government and other sources. Hachures lie within area undergoing urbanization.

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PRODUCTION-CONSUMPTION REGION BOUNDARY
(see text for discussion)

MINERAL RESOURCE ZONE BOUNDARIES

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See text for additional explanation of MRZ Symbols.

CONTOUR INTERVAL 20 FEET

MOORPARK, CALIF.

MINERAL LAND CLASSIFICATION MAP
AGGREGATE RESOURCES ONLY

PREPARED IN COMPLIANCE WITH THE SURFACE MINING AND RECLAMATION ACT OF 1975, ARTICLE 4, SECTION 2761

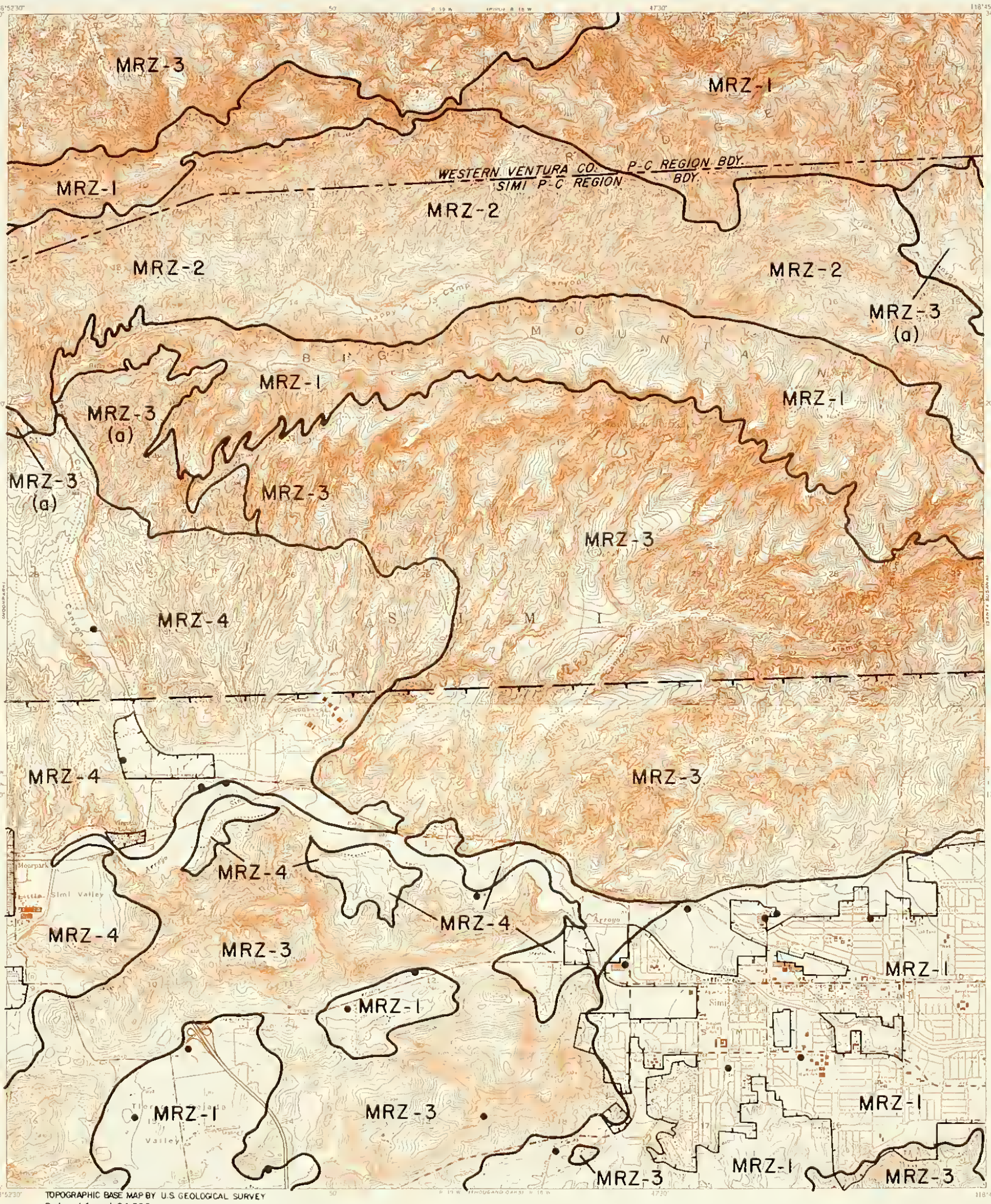
James F. Davis
STATE GEOLOGIST AUGUST 21, 1981

CALIFORNIA DIVISION OF MINES AND GEOLOGY
JAMES F. DAVIS, STATE GEOLOGIST

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF CONSERVATION

SIMI QUADRANGLE

SPECIAL REPORT 145 PLATE 1.12



TOPOGRAPHIC BASE MAP BY U.S. GEOLOGICAL SURVEY
Reduced from 1:24,000

EXPLANATION

- Drill hole

OUTER BOUNDARY OF AREAS SUBJECT TO URBANIZATION
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PRODUCTION-CONSUMPTION REGION BOUNDARY
(see text for discussion)

MINERAL RESOURCE ZONE BOUNDARIES

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See text for additional explanation of MRZ Symbols.

CONTOUR INTERVAL 20 FEET
DOTTED LINES REPRESENT HALF-INTERVAL CONTOURS
DATUM IS MEAN SEA LEVEL

SIMI, CALIF.

REVISED VERSION
SUPERCEDES MAP DATED
AUGUST 21, 1981

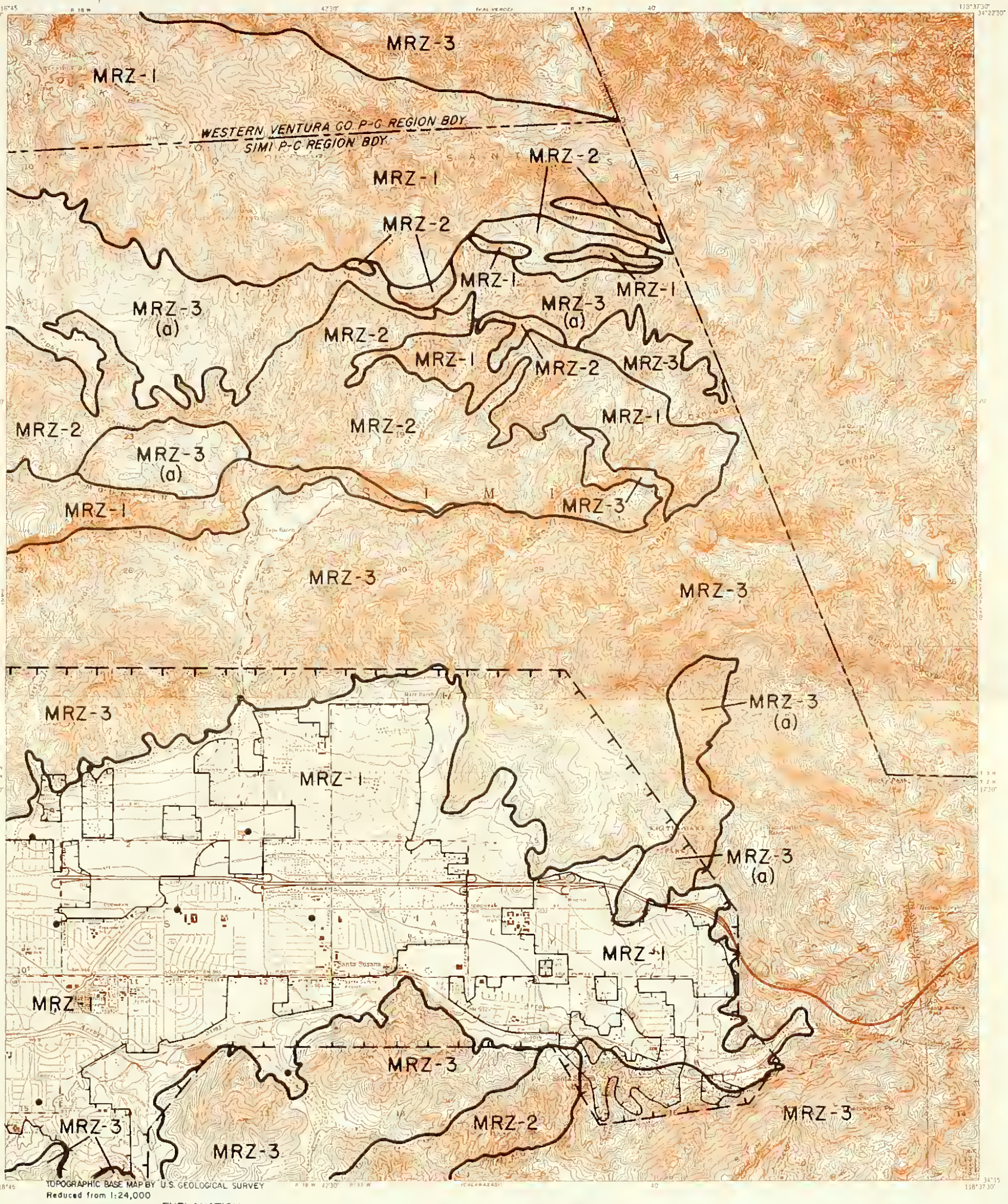
MINERAL LAND CLASSIFICATION MAP
AGGREGATE RESOURCES ONLY

PREPARED IN COMPLIANCE WITH THE SURFACE MINING AND RECLAMATION ACT OF 1975, ARTICLE 4, SECTION 2761

James F. Davis
STATE GEOLOGIST AUGUST 21, 1981

CALIFORNIA DIVISION OF MINES AND GEOLOGY
JAMES F. DAVIS, STATE GEOLOGIST

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF CONSERVATION



TOPOGRAPHIC BASE MAP BY U.S. GEOLOGICAL SURVEY
Reduced from 1:24,000

EXPLANATION

- Drill hole

OUTER BOUNDARY OF AREAS SUBJECT TO URBANIZATION
Boundaries established from data supplied by the Office of Planning and Research with modifications developed from information supplied by local government and other sources. Hachures lie within area undergoing urbanization.

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PRODUCTION-CONSUMPTION REGION BOUNDARY
(see text for discussion)

MINERAL RESOURCE ZONE BOUNDARIES

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See text for additional explanation of MRZ Symbols.

CONTOUR INTERVAL 25 FEET
DOTTED LINES REPRESENT 5 FOOT CONTOURS
DATUM IS MEAN SEA LEVEL

SANTA SUSANA CALIF.

MINERAL LAND CLASSIFICATION MAP
AGGREGATE RESOURCES ONLY

PREPARED IN COMPLIANCE WITH THE SURFACE MINING AND RECLAMATION ACT OF 1975, ARTICLE 4, SECTION 2761

James F. Davis
STATE GEOLOGIST AUGUST 21, 1981

CALIFORNIA DIVISION OF MINES AND GEOLOGY
JAMES F. DAVIS, STATE GEOLOGIST

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF CONSERVATION

OAT MOUNTAIN QUADRANGLE

SPECIAL REPORT 145 PLATE I.14

TOPOGRAPHIC BASE MAP BY U.S. GEOLOGICAL SURVEY
Reduced from 1:24,000

EXPLANATION

- Drill hole

OUTER BOUNDARY OF AREAS SUBJECT TO URBANIZATION
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PRODUCTION-CONSUMPTION REGION BOUNDARY
(see text for discussion)

MINERAL RESOURCE ZONE BOUNDARIES

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See text for additional explanation of MRZ Symbols.

OAT MOUNTAIN, CALIF.

MINERAL LAND CLASSIFICATION MAP
AGGREGATE RESOURCES ONLY

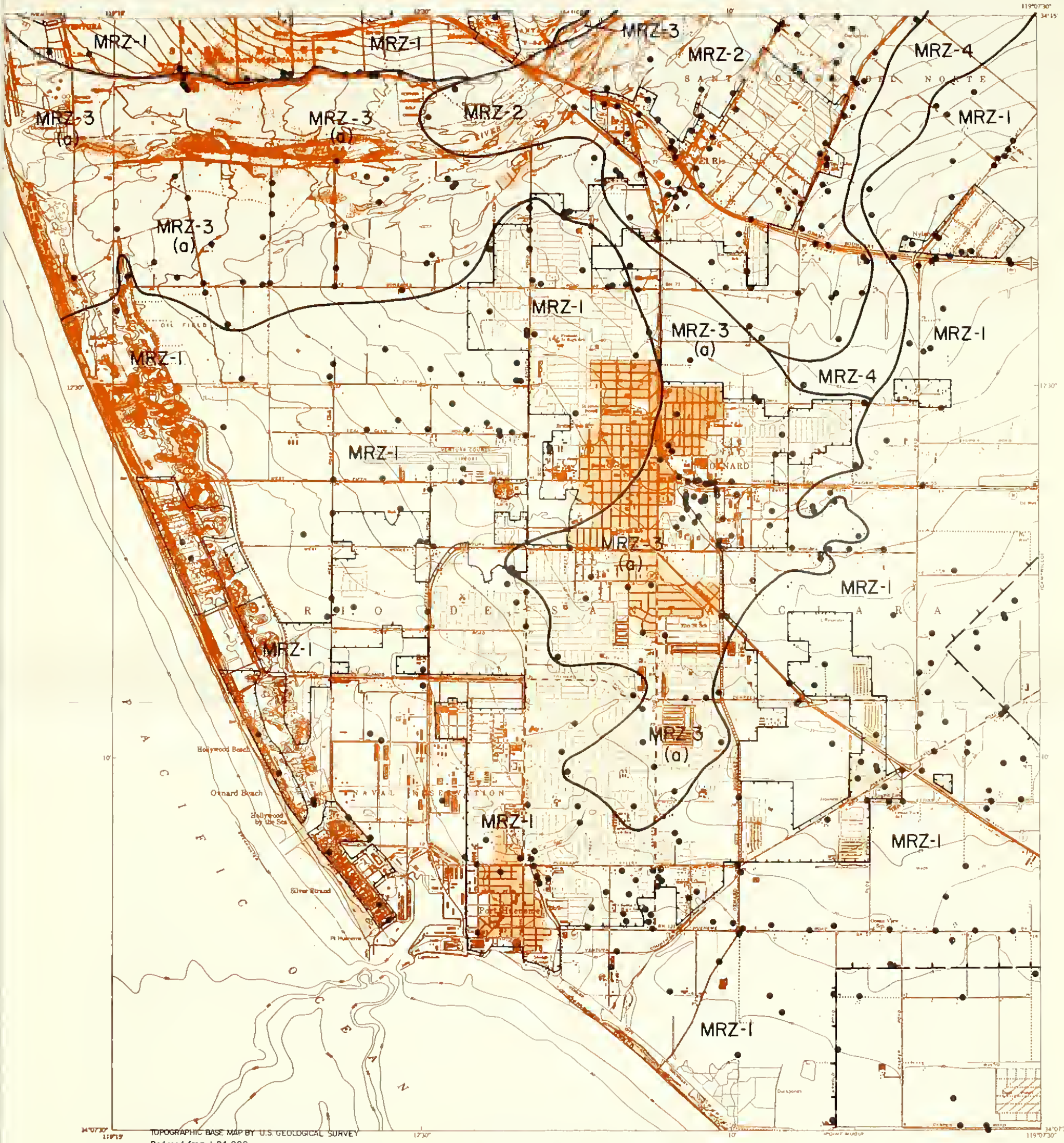
PREPARED IN COMPLIANCE WITH THE SURFACE MINING AND RECLAMATION ACT OF 1975, ARTICLE 4, SECTION 2761

James F. Davis
STATE GEOLOGIST AUGUST 21, 1981

CALIFORNIA DIVISION OF MINES AND GEOLOGY
JAMES F. DAVIS, STATE GEOLOGIST

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF CONSERVATION

OXNARD QUADRANGLE
SPECIAL REPORT 145 PLATE 1.15



TOPOGRAPHIC BASE MAP BY U.S. GEOLOGICAL SURVEY
Reduced from 1:24,000

EXPLANATION

- Drill hole

OUTER BOUNDARY OF AREAS SUBJECT TO URBANIZATION
Boundaries established from data supplied by the Office of Planning and Research with modifications developed from information supplied by local government and other sources. Hachures lie within area undergoing urbanization.

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PRODUCTION-CONSUMPTION REGION BOUNDARY
(see text for discussion)

MINERAL RESOURCE ZONE BOUNDARIES

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See text for additional explanation of MRZ Symbols.

CONTOUR INTERVAL 5 FEET
DATUM IS MEAN SEA LEVEL
DEPTH CURVES IN FEET—DATUM IS MEAN LOWER LOW WATER
SHORELINE SHOWN REPRESENTS THE APPROXIMATE LINE OF MEAN HIGH WATER
THE MEAN RANGE OF TIDE IS APPROXIMATELY 6 FEET

OXNARD, CALIF.

REVISED VERSION
SUPERCEDES MAP DATED
AUGUST 21, 1981

MINERAL LAND CLASSIFICATION MAP
AGGREGATE RESOURCES ONLY

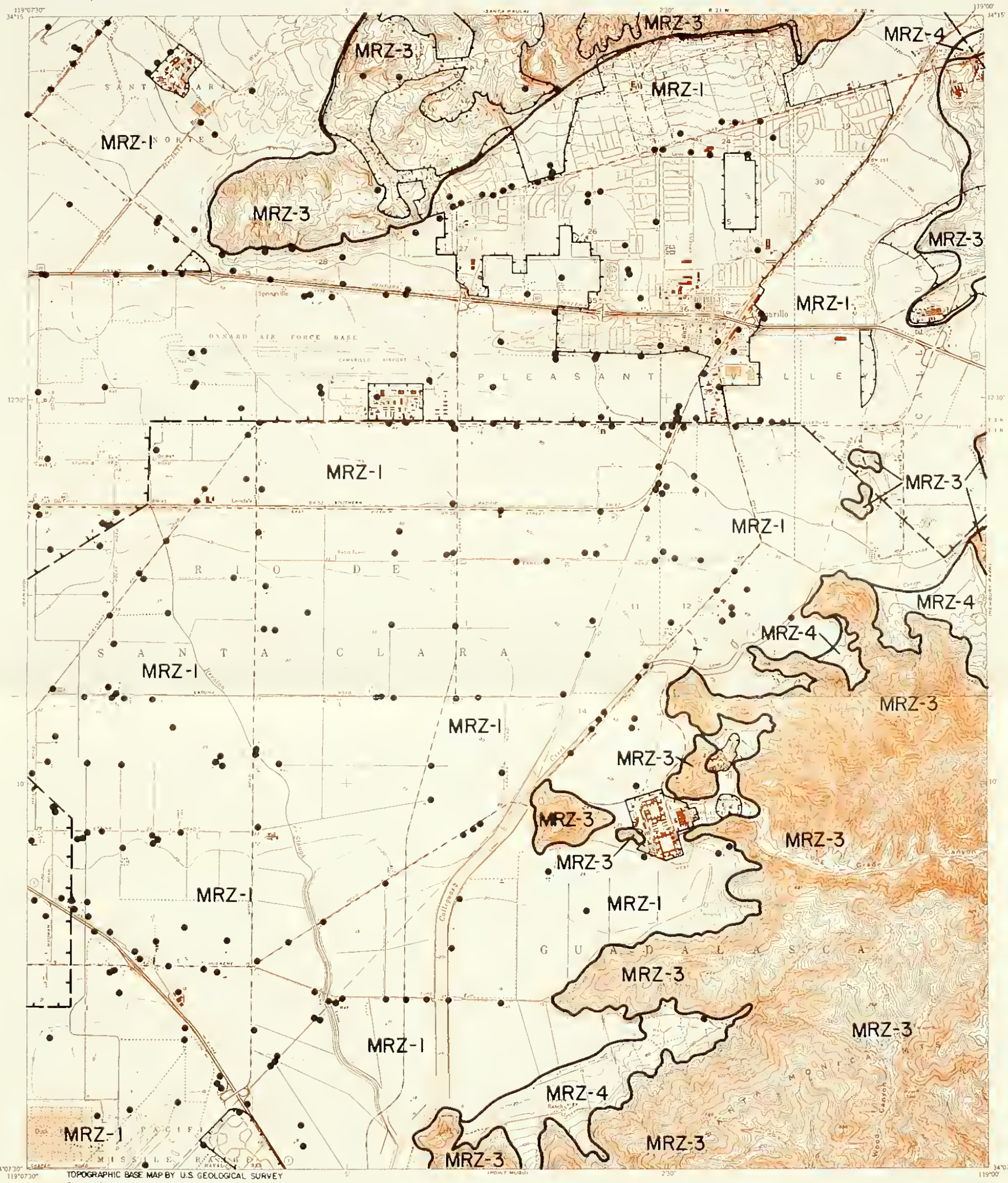
PREPARED IN COMPLIANCE WITH THE SURFACE MINING AND RECLAMATION ACT OF 1975, ARTICLE 4, SECTION 2761

James F. Davis
STATE GEOLOGIST AUGUST 21, 1981

CALIFORNIA DIVISION OF MINES AND GEOLOGY
JAMES F. DAVIS, STATE GEOLOGIST

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF CONSERVATION

CAMARILLO QUADRANGLE
SPECIAL REPORT 145 PLATE 1.16



TOPOGRAPHIC BASE MAP BY U.S. GEOLOGICAL SURVEY
Reduced from 1:24,000

CONTOUR INTERVAL 20 FEET
DOTTED LINES REPRESENT 5 FOOT CONTOURS
DATUM IS MEAN SEA LEVEL

CAMARILLO, CALIF

EXPLANATION

Drill hole

OUTER BOUNDARY OF AREAS SUBJECT TO URBANIZATION
Boundaries established from data supplied by the Office of Planning and Research with modifications developed from information supplied by local government and other sources. Hachures lie within area undergoing urbanization.

EXISTING URBAN BOUNDARIES
Boundaries established by the Office of Planning and Research and by data supplied by local government agencies and other sources to reflect present conditions. Hachures lie within urban area.

PRODUCTION-CONSUMPTION REGION BOUNDARY
(see text for discussion)

MINERAL RESOURCE ZONE BOUNDARIES

MRZ-2

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See text for additional explanation of MRZ Symbols.

REVISED VERSION
SUPERCEDES MAP DATED
AUGUST 21,1981

MINERAL LAND CLASSIFICATION MAP
AGGREGATE RESOURCES ONLY

PREPARED IN COMPLIANCE WITH THE SURFACE MINING AND RECLAMATION ACT OF 1975, ARTICLE 4, SECTION 2761

James F. Davis
STATE GEOLOGIST AUGUST 21,1981

CALIFORNIA DIVISION OF MINES AND GEOLOGY
JAMES F. DAVIS, STATE GEOLOGIST

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF CONSERVATION

NEWBURY PARK QUADRANGLE
SPECIAL REPORT 145 PLATE 1.17

TOPOGRAPHIC BASE MAP BY U.S. GEOLOGICAL SURVEY
Reduced from 1:24,000

EXPLANATION

Drill hole

OUTER BOUNDARY OF AREAS SUBJECT TO URBANIZATION
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PRODUCTION-CONSUMPTION REGION BOUNDARY
(see text for discussion)

MINERAL RESOURCE ZONE BOUNDARIES

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MRZ-4 Areas where available information is inadequate for assignment to any other MRZ zone.

See text for additional explanation of MRZ Symbols.

REVISED VERSION
SUPERCEDES MAP DATED
AUGUST 21,1981

NEWBURY PARK CALIF

MINERAL LAND CLASSIFICATION MAP
AGGREGATE RESOURCES ONLY

PREPARED IN COMPLIANCE WITH THE SURFACE MINING AND RECLAMATION ACT OF 1975, ARTICLE 4, SECTION 2761

James F. Davis
STATE GEOLOGIST AUGUST 21,1981

CALIFORNIA DIVISION OF MINES AND GEOLOGY
JAMES F. DAVIS, STATE GEOLOGIST

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF CONSERVATION

THOUSAND OAKS QUADRANGLE
SPECIAL REPORT 145 PLATE 1.18

TOPOGRAPHIC BASE MAP BY U.S. GEOLOGICAL SURVEY
Reduced from 1:24,000

EXPLANATION

- Drill hole

OUTER BOUNDARY OF AREAS SUBJECT TO URBANIZATION
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PRODUCTION-CONSUMPTION REGION BOUNDARY
(see text for discussion)

MINERAL RESOURCE ZONE BOUNDARIES

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See text for additional explanation of MRZ Symbols.

THOUSAND OAKS, CALIF.

MINERAL LAND CLASSIFICATION MAP
AGGREGATE RESOURCES ONLY

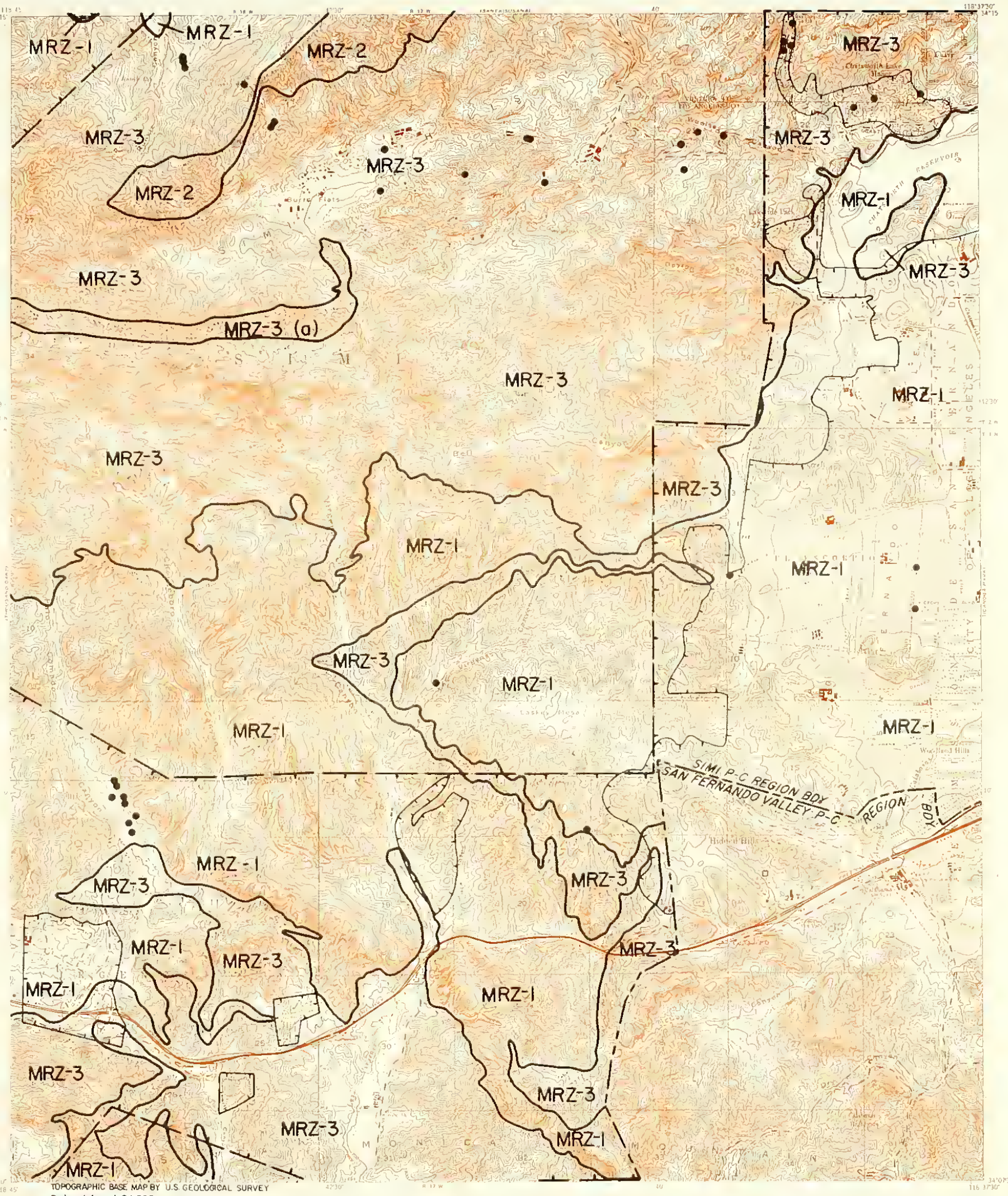
PREPARED IN COMPLIANCE WITH THE SURFACE MINING AND RECLAMATION ACT OF 1975, ARTICLE 4, SECTION 2761

James F. Davis
STATE GEOLOGIST AUGUST 21, 1981

CALIFORNIA DIVISION OF MINES AND GEOLOGY
JAMES F. DAVIS, STATE GEOLOGIST

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF CONSERVATION

CALABASAS QUADRANGLE
SPECIAL REPORT 145 PLATE 1.19



TOPOGRAPHIC BASE MAP BY U.S. GEOLOGICAL SURVEY
Reduced from 1:24,000

CONTOUR INTERVAL 25 FEET

CALABASAS, CALIF

EXPLANATION

- Drill hole
- OUTER BOUNDARY OF AREAS SUBJECT TO URBANIZATION
  Boundaries established from data supplied by the Office of Planning and Research with modifications developed from information supplied by local government and other sources. Hachures lie within area undergoing urbanization.
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- PRODUCTION-CONSUMPTION REGION BOUNDARY
  (see text for discussion)
- MINERAL RESOURCE ZONE BOUNDARIES

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REVISED VERSION
SUPERCEDES MAP DATED
AUGUST 21, 1981

MINERAL LAND CLASSIFICATION MAP
AGGREGATE RESOURCES ONLY

PREPARED IN COMPLIANCE WITH THE SURFACE MINING AND RECLAMATION ACT OF 1975, ARTICLE 4, SECTION 2761

James F. Davis
STATE GEOLOGIST AUGUST 21, 1981

CALIFORNIA DIVISION OF MINES AND GEOLOGY
JAMES F. DAVIS, STATE GEOLOGIST

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF CONSERVATION

CANOGA PARK QUADRANGLE
SPECIAL REPORT 145 PLATE 1.20

TOPOGRAPHIC BASE MAP BY U.S. GEOLOGICAL SURVEY
Reduced from 1:24,000

EXPLANATION

- Drill hole

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PRODUCTION-CONSUMPTION REGION BOUNDARY
(see text for discussion)

MINERAL RESOURCE ZONE BOUNDARIES

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See text for additional explanation of MRZ Symbols.

CONTOUR INTERVAL 25 FEET
DOTTED LINES REPRESENT 5 FOOT CONTOURS
DATUM IS MEAN SEA LEVEL

CANOGA PARK, CALIF.

MINERAL LAND CLASSIFICATION MAP
AGGREGATE RESOURCES ONLY

PREPARED IN COMPLIANCE WITH THE SURFACE MINING AND RECLAMATION ACT OF 1975, ARTICLE 4, SECTION 2761

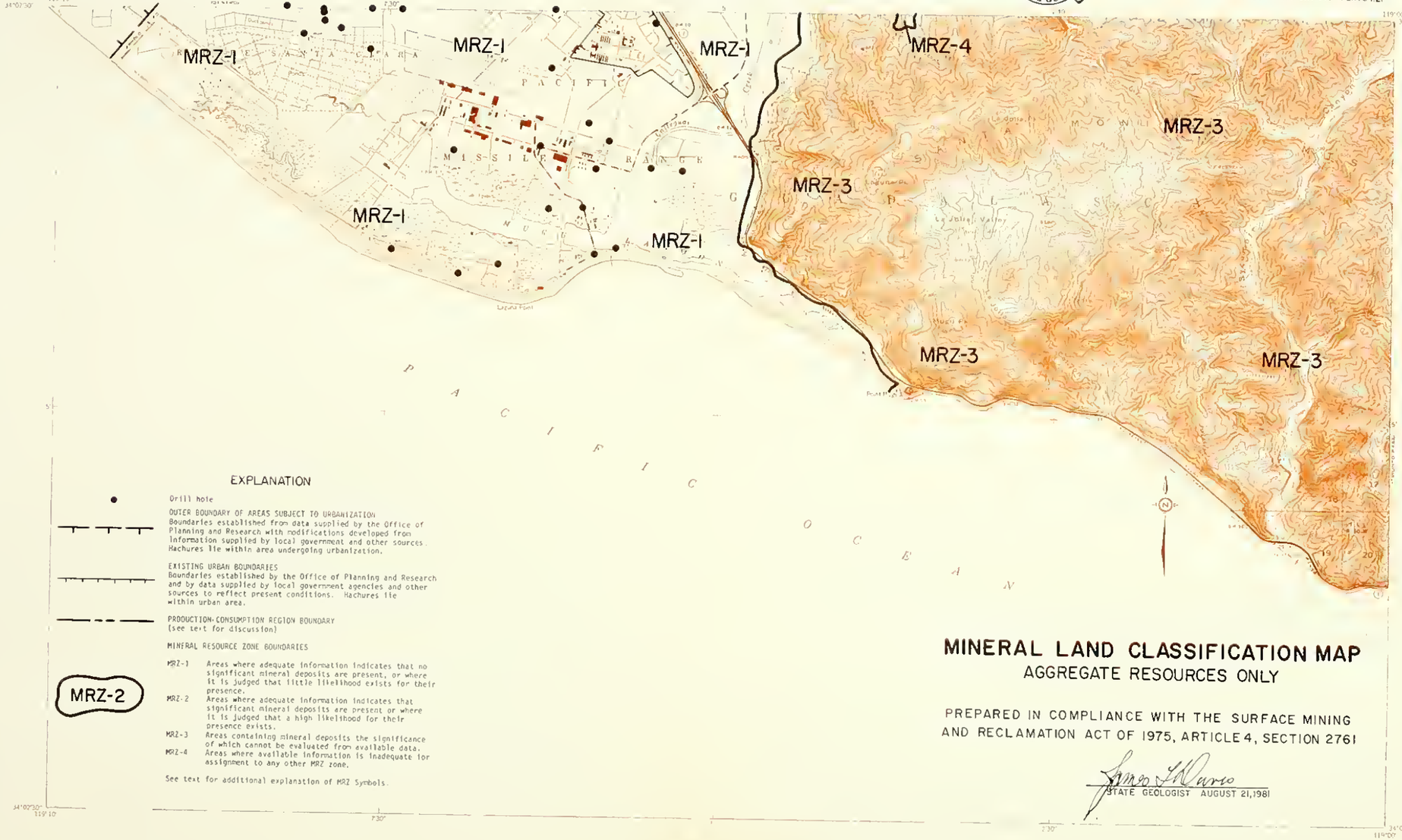
James F. Davis
STATE GEOLOGIST AUGUST 21, 1981

CALIFORNIA DIVISION OF MINES AND GEOLOGY
JAMES F. DAVIS, STATE GEOLOGIST

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF CONSERVATION

POINT MUGU QUADRANGLE

SPECIAL REPORT 145 PLATE 1.21



EXPLANATION

Drill hole

OUTER BOUNDARY OF AREAS SUBJECT TO URBANIZATION
Boundaries established from data supplied by the Office of Planning and Research with modifications developed from information supplied by local government and other sources. Hachures lie within area undergoing urbanization.

EXISTING URBAN BOUNDARIES
Boundaries established by the Office of Planning and Research and by data supplied by local government agencies and other sources to reflect present conditions. Hachures lie within urban area.

PRODUCTION-CONSUMPTION REGION BOUNDARY
(see text for discussion)

MINERAL RESOURCE ZONE BOUNDARIES

MRZ-2

MRZ-1 Areas where adequate information indicates that no significant mineral deposits are present, or where it is judged that little likelihood exists for their presence.

MRZ-2 Areas where adequate information indicates that significant mineral deposits are present or where it is judged that a high likelihood for their presence exists.

MRZ-3 Areas containing mineral deposits the significance of which cannot be evaluated from available data.

MRZ-4 Areas where available information is inadequate for assignment to any other MRZ zone.

See text for additional explanation of MRZ Symbols.

MINERAL LAND CLASSIFICATION MAP
AGGREGATE RESOURCES ONLY

PREPARED IN COMPLIANCE WITH THE SURFACE MINING AND RECLAMATION ACT OF 1975, ARTICLE 4, SECTION 2761

James F. Davis
STATE GEOLOGIST AUGUST 21, 1981

CONTOUR INTERVAL 20 FEET
DOTTED LINES REPRESENT HALF INTERVAL CONTOURS
DATUM IS MEAN SEA LEVEL

POINT MUGU, CALIF.

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JAMES F. DAVIS, STATE GEOLOGIST

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF CONSERVATION

TRIUNFO PASS QUADRANGLE
SPECIAL REPORT 145 PLATE 1.22

TOPOGRAPHIC BASE MAP BY U.S. GEOLOGICAL SURVEY
Reduced from 1:24,000

CONTOUR INTERVAL 25 FEET
DATUM IS MEAN SEA LEVEL

TRIUNFO PASS, CALIF

EXPLANATION

- Drill hole

OUTER BOUNDARY OF AREAS SUBJECT TO URBANIZATION
Boundaries established from data supplied by the Office of Planning and Research with modifications developed from information supplied by local government and other sources. Hachures lie within area undergoing urbanization.

EXISTING URBAN BOUNDARIES
Boundaries established by the Office of Planning and Research and by data supplied by local government agencies and other sources to reflect present conditions. Hachures lie within urban area.

PRODUCTION-CONSUMPTION REGION BOUNDARY
(see text for discussion)

MINERAL RESOURCE ZONE BOUNDARIES

MRZ-2

- MRZ-1 Areas where adequate information indicates that no significant mineral deposits are present, or where it is judged that little likelihood exists for their presence.
- MRZ-2 Areas where adequate information indicates that significant mineral deposits are present or where it is judged that a high likelihood for their presence exists.
- MRZ-3 Areas containing mineral deposits the significance of which cannot be evaluated from available data.
- MRZ-4 Areas where available information is inadequate for assignment to any other MRZ zone.

See text for additional explanation of MRZ Symbols.

MINERAL LAND CLASSIFICATION MAP
AGGREGATE RESOURCES ONLY

PREPARED IN COMPLIANCE WITH THE SURFACE MINING AND RECLAMATION ACT OF 1975, ARTICLE 4, SECTION 2761

James F. Davis
STATE GEOLOGIST AUGUST 21, 1981

CALIFORNIA DIVISION OF MINES AND GEOLOGY
JAMES F. DAVIS, STATE GEOLOGIST

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF CONSERVATION

POINT DUME QUADRANGLE

SPECIAL REPORT 145 PLATE 1.23

TOPOGRAPHIC BASE MAP BY U.S. GEOLOGICAL SURVEY

Reduced from 1:24,000

CONTOUR INTERVAL 25 FEET
DATUM IS MEAN SEA LEVEL

POINT DUME, CALIF

EXPLANATION

- Drill hole

OUTER BOUNDARY OF AREAS SUBJECT TO URBANIZATION
Boundaries established from data supplied by the Office of Planning and Research with modifications developed from information supplied by local government and other sources. Hachures lie within area undergoing urbanization.

EXISTING URBAN BOUNDARIES
Boundaries established by the Office of Planning and Research and by data supplied by local government agencies and other sources to reflect present conditions. Hachures lie within urban area.

PRODUCTION-CONSUMPTION REGION BOUNDARY
(see text for discussion)

MINERAL RESOURCE ZONE BOUNDARIES

MRZ-2

- MRZ-1 Areas where adequate information indicates that no significant mineral deposits are present, or where it is judged that little likelihood exists for their presence.
- MRZ-2 Areas where adequate information indicates that significant mineral deposits are present or where it is judged that a high likelihood for their presence exists.
- MRZ-3 Areas containing mineral deposits the significance of which cannot be evaluated from available data.
- MRZ-4 Areas where available information is inadequate for assignment to any other MRZ zone.

See text for additional explanation of MRZ Symbols.

REVISED VERSION
SUPERCEDES MAP DATED
AUGUST 21, 1981

MINERAL LAND CLASSIFICATION MAP

AGGREGATE RESOURCES ONLY

PREPARED IN COMPLIANCE WITH THE SURFACE MINING AND RECLAMATION ACT OF 1975, ARTICLE 4, SECTION 2761

James F. Davis
STATE GEOLOGIST AUGUST 21, 1981

CALIFORNIA DIVISION OF MINES AND GEOLOGY
JAMES F. DAVIS, STATE GEOLOGIST

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF CONSERVATION

MALIBU BEACH QUADRANGLE
SPECIAL REPORT 145 PLATE 1.24

TOPOGRAPHIC BASE MAP BY U.S. GEOLOGICAL SURVEY
Reduced from 1:24,000

CONTOUR INTERVAL 25 FEET
DATUM IS MEAN SEA LEVEL

MALIBU BEACH, CALIF.

EXPLANATION

- Drill hole

OUTER BOUNDARY OF AREAS SUBJECT TO URBANIZATION
Boundaries established from data supplied by the Office of Planning and Research with modifications developed from information supplied by local government and other sources. Hachures lie within area undergoing urbanization.

EXISTING URBAN BOUNDARIES
Boundaries established by the Office of Planning and Research and by data supplied by local government agencies and other sources to reflect present conditions. Hachures lie within urban area.

PRODUCTION-CONSUMPTION REGION BOUNDARY
(see text for discussion)

MINERAL RESOURCE ZONE BOUNDARIES

MRZ-2

- MRZ-1 Areas where adequate information indicates that no significant mineral deposits are present, or where it is judged that little likelihood exists for their presence.
- MRZ-2 Areas where adequate information indicates that significant mineral deposits are present or where it is judged that a high likelihood for their presence exists.
- MRZ-3 Areas containing mineral deposits the significance of which cannot be evaluated from available data.
- MRZ-4 Areas where available information is inadequate for assignment to any other MRZ zone.

See text for additional explanation of MRZ Symbols.

REVISED VERSION
SUPERCEDES MAP DATED
AUGUST 21, 1981

MINERAL LAND CLASSIFICATION MAP
AGGREGATE RESOURCES ONLY

PREPARED IN COMPLIANCE WITH THE SURFACE MINING AND RECLAMATION ACT OF 1975, ARTICLE 4, SECTION 2761

James F. Davis
STATE GEOLOGIST AUGUST 21, 1981

MINERAL LAND CLASSIFICATION OF VENTURA COUNTY

GENERALIZED AGGREGATE RESOURCE CLASSIFICATION MAP

SIMI, WESTERN VENTURA COUNTY AND ADJACENT PRODUCTION-CONSUMPTION REGIONS

By: T.P. ANDERSON, R.C.LOYD, E.W. KIESSLING, S.L. KOHLER, AND R.V. MILLER

1981

EXPLANATION

1 MRZ-1 Areas where adequate information indicates that no significant mineral deposits are present, or where it is judged that little likelihood exists for their presence.

2 MRZ-2 Areas where adequate information indicates that significant mineral deposits are present or where it is judged that a high likelihood for their presence exists.

3 MRZ-3 Areas containing mineral deposits the significance of which cannot be evaluated from available data.

4 MRZ-4 Areas where available information is inadequate for assignment to any other MRZ zone.

PRZ-2 *PRZ-2 Areas where preliminary information indicates that significant mineral deposits are present or where it is judged that a high likelihood for their presence exists.

PRZ-3 *PRZ-3 Areas containing mineral deposits the significance of which cannot be evaluated from preliminary data.

~ PRODUCTION-CONSUMPTION REGION BOUNDARY

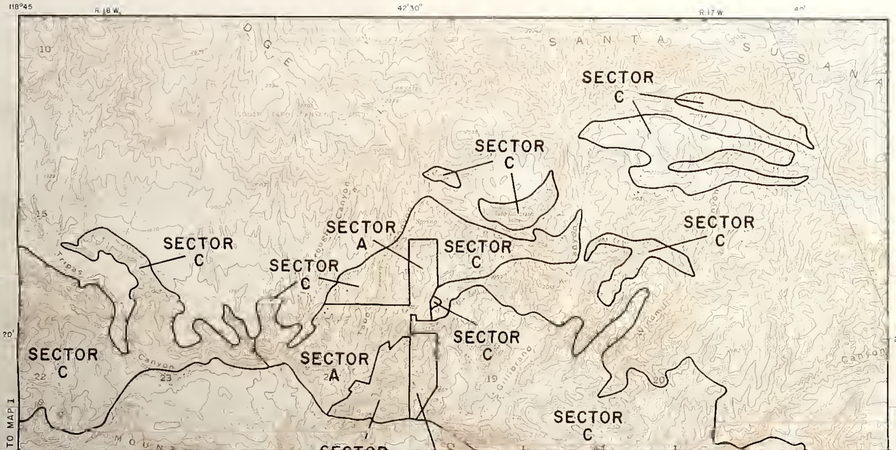
Grid lines represent U.S. Topographic quadrangles - see quadrangle index map, Figure 1.3.

*These areas will receive more attention at later dates when the production-consumption regions within which they are located are fully studied for mineral resource classification.

Topographic base map by U.S. Geological Survey

MAP I

MAP II



Mineral Land Classification of Ventura County

SIMI VALLEY PRODUCTION DISTRICT

Aggregate Resource Sectors A-C

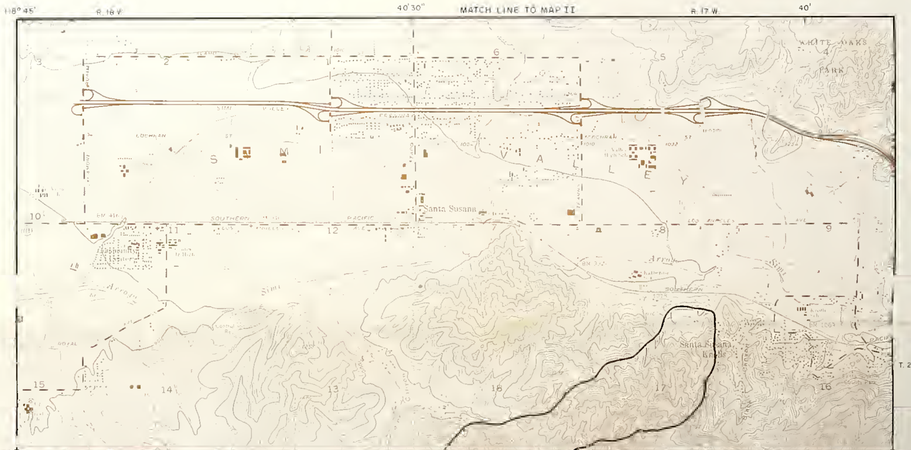
by

T.P. Anderson, R.C. Loyd, E.W. Kiesslin, S.L. Kohler, R.V. Miller

1981

SCALE 1:24,000

MAP III



MAP II

Mineral Land Classification of Ventura County

SIMI VALLEY PRODUCTION DISTRICT

Aggregate Resource Sectors A-C

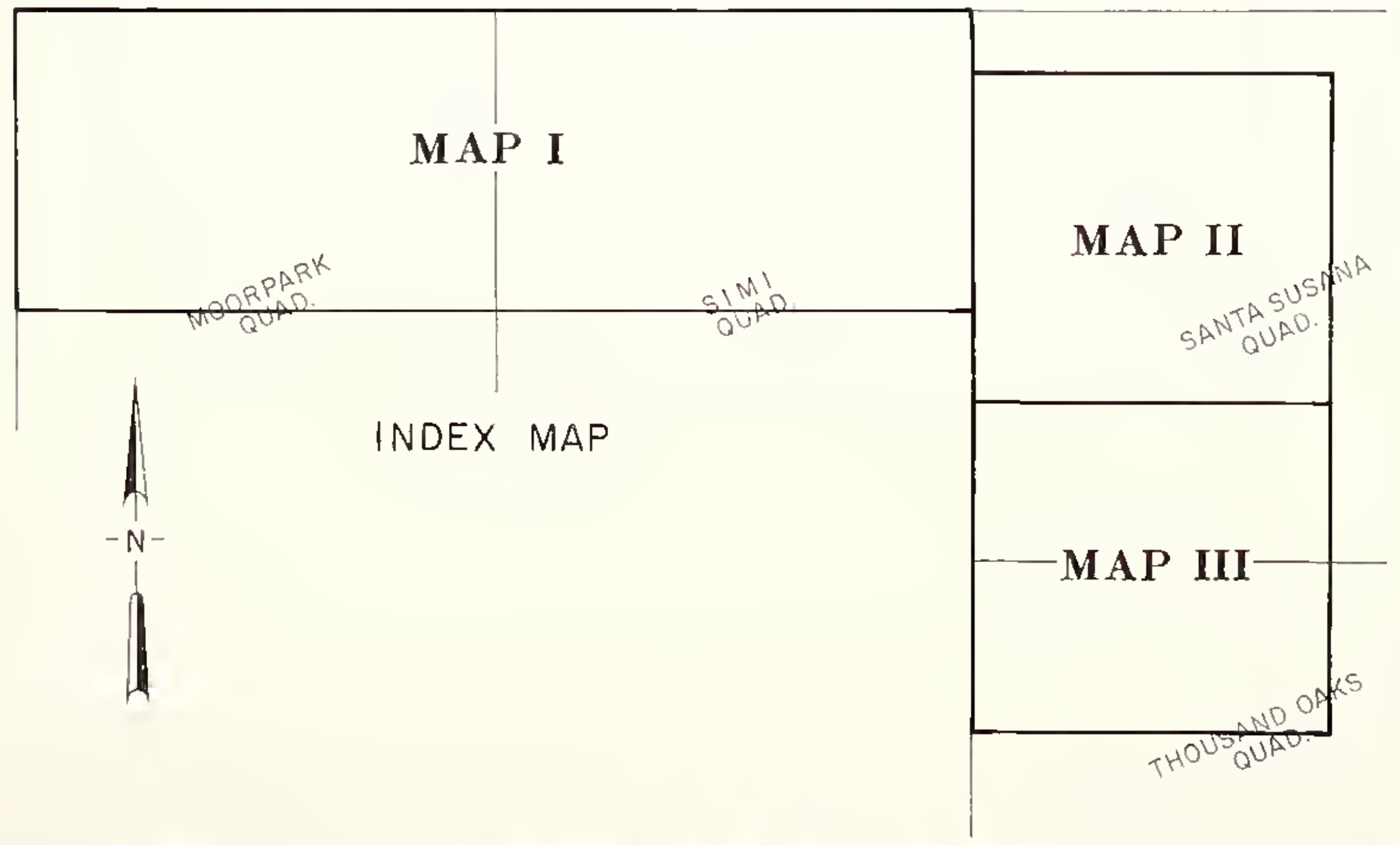
by

T.P. Anderson, R.C. Loyd, E.W. Kiessling, S.L. Kohler, R.V. Miller

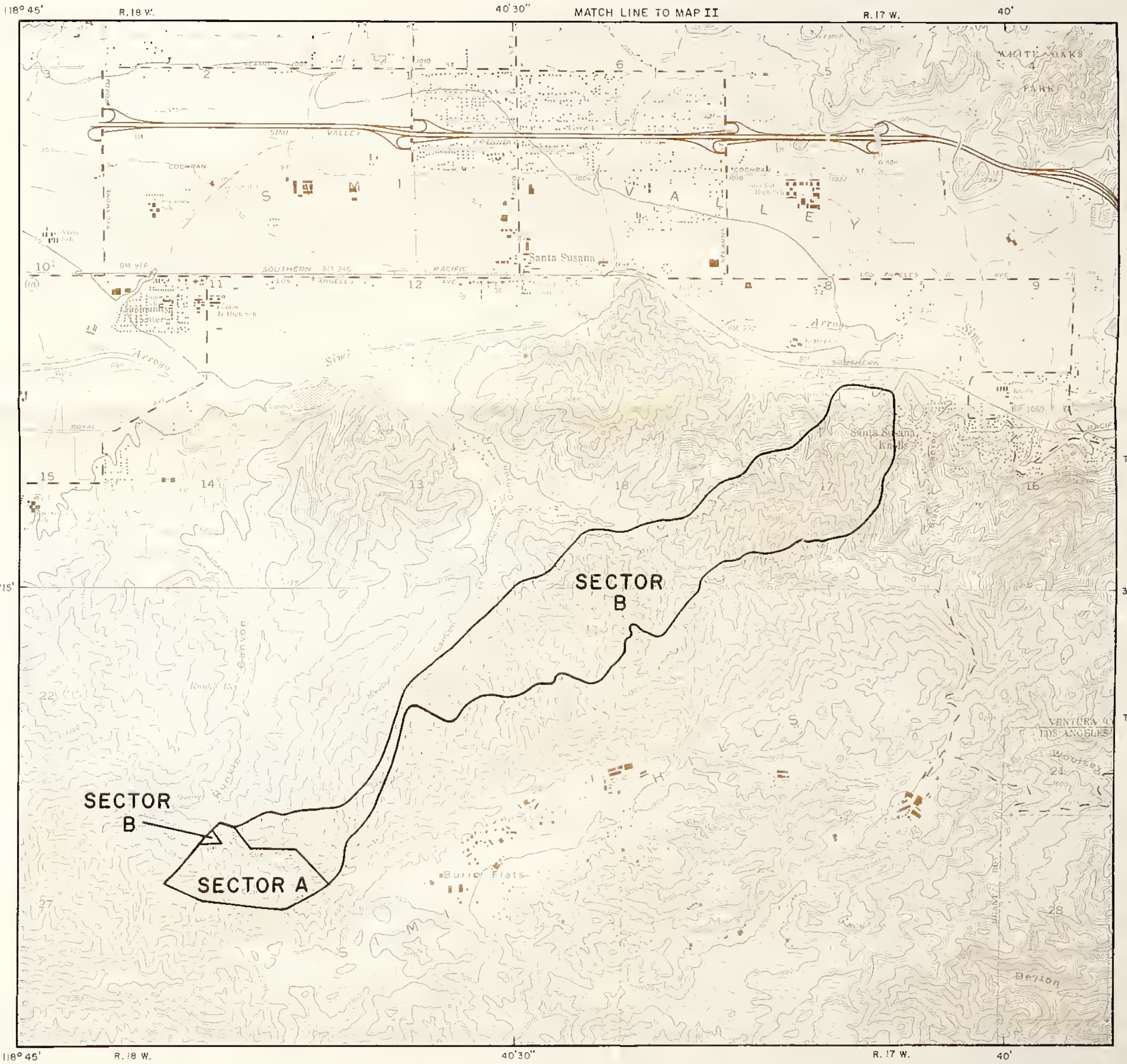
1981

SCALE 1:24,000

Area underlain by extractable sand and gravel.



MAP III



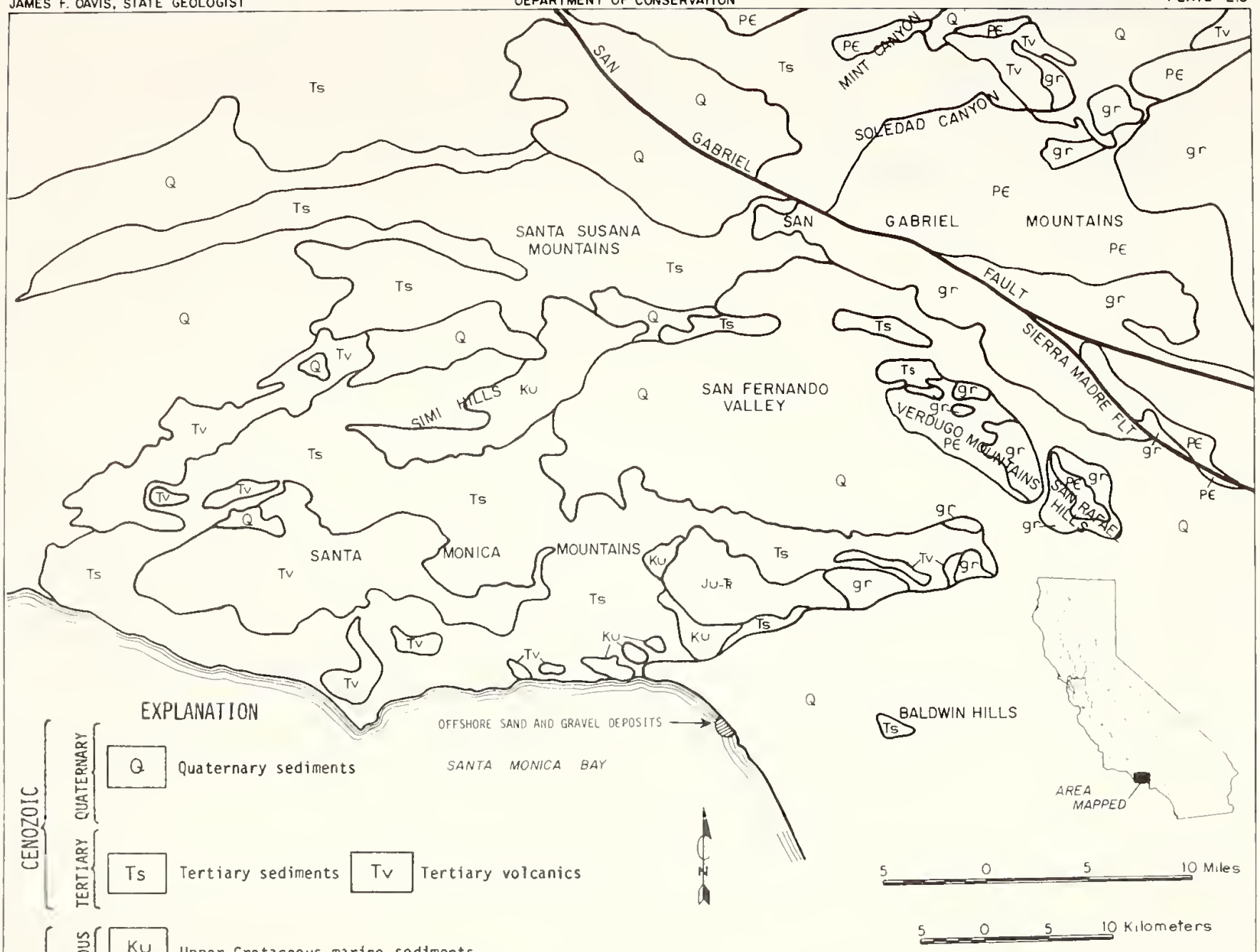
Topographic bases by U.S. Geological Survey

Drafted by Louise Huckaby.

CALIFORNIA OIVISION OF MINES ANO GEOLOGY
JAMES F. OAVIS, STATE GEOLOGIST

STATE OF CALIFORNIA
THE RESOURCES AGENCY
OEPARTMENT OF CONSERVATION

SPECIAL REPORT 145
PLATE 2.3



EXPLANATION

CENOZOIC
- QUATERNARY
  - Q — Quaternary sediments
- TERTIARY
  - Ts — Tertiary sediments
  - Tv — Tertiary volcanics

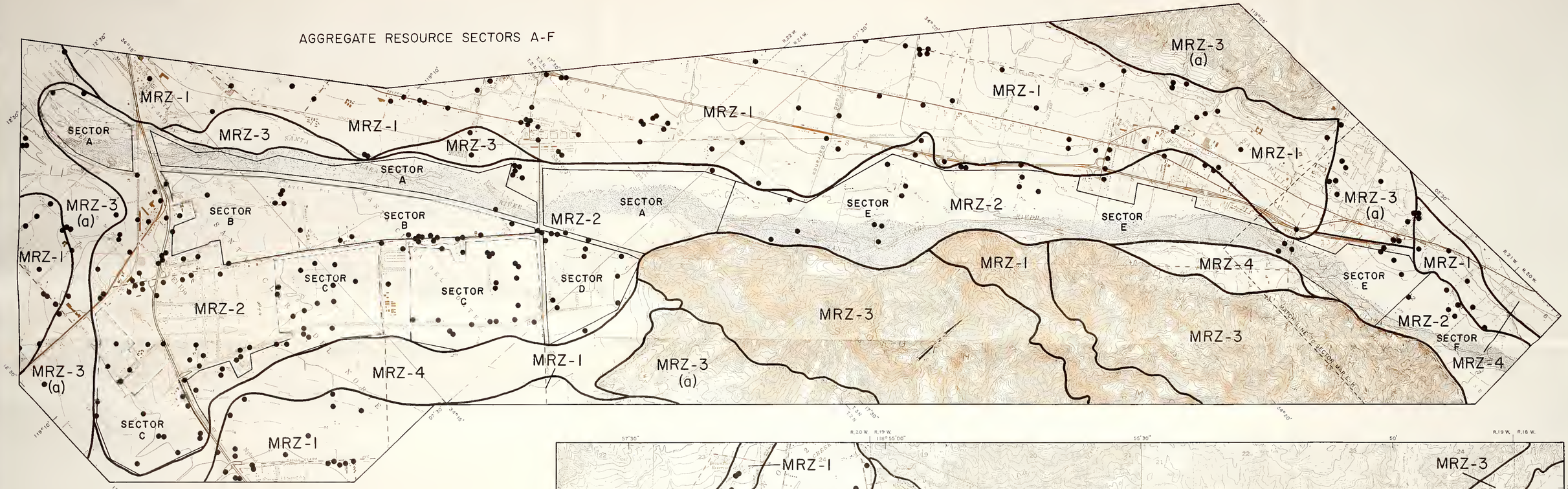
MESOZOIC
- CRETACEOUS
  - Ku — Upper Cretaceous marine sediments
  - gr — Mesozoic granitic rock
- TRI-ASSIC JUR-ASSIC
  - JuTr — Jurassic-Triassic metamorphic rocks

PRECAMBRIAN
- PE — Precambrian metamorphic rocks

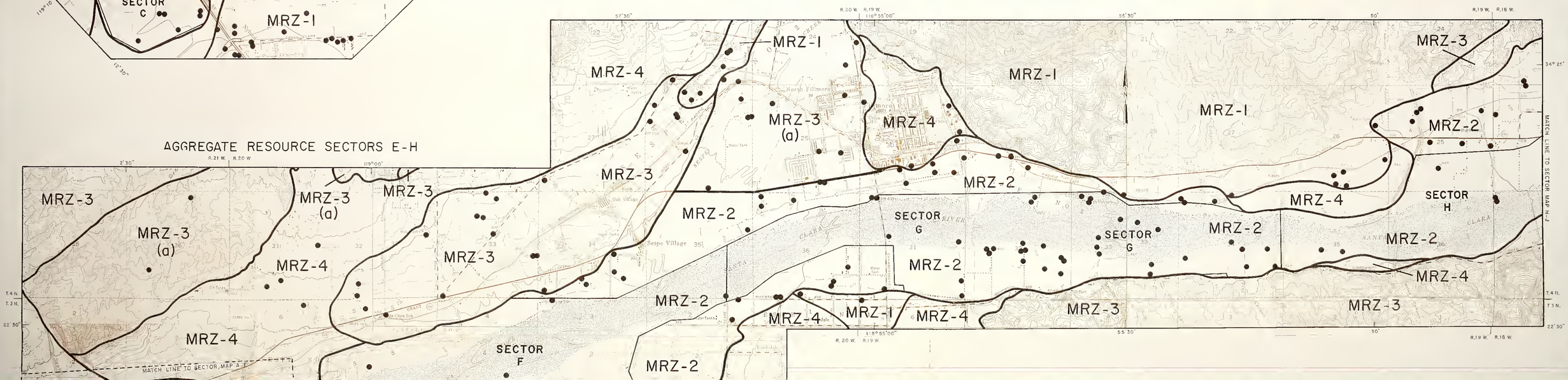
GENERALIZED GEOLOGIC MAP,
WESTERN LOS ANGELES-VENTURA COUNTY AREA

Map from Special Report 143, Plate 2.4

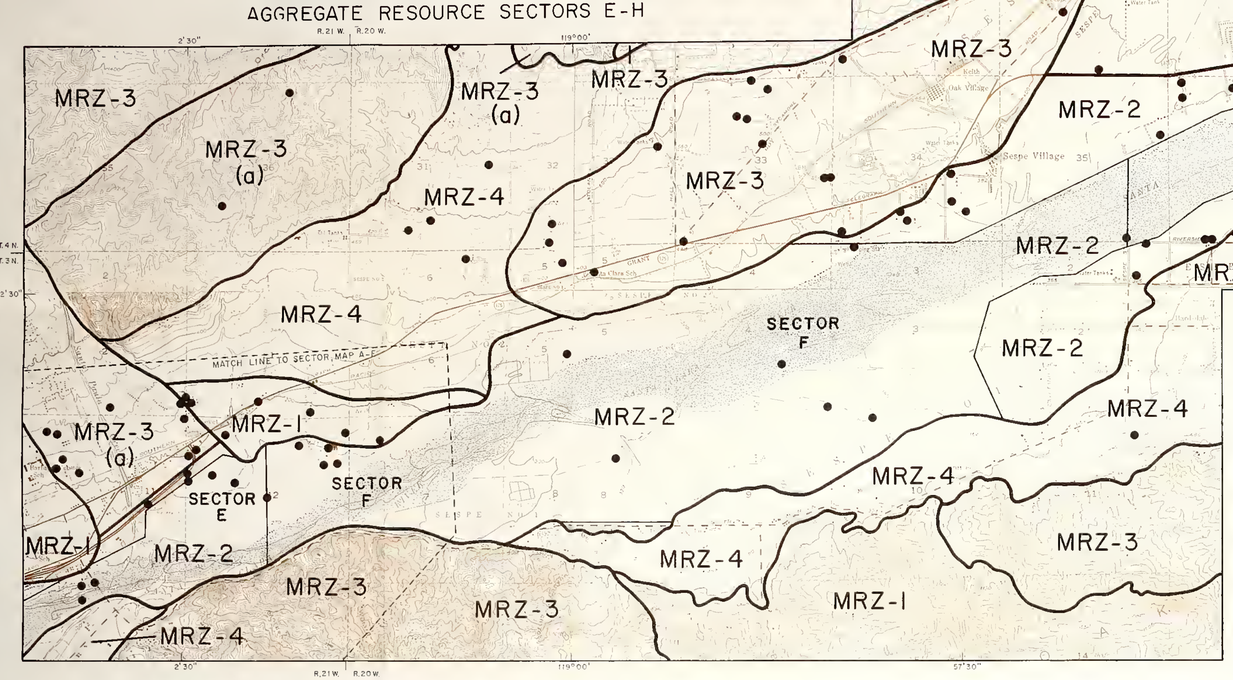
AGGREGATE RESOURCE SECTORS A-F

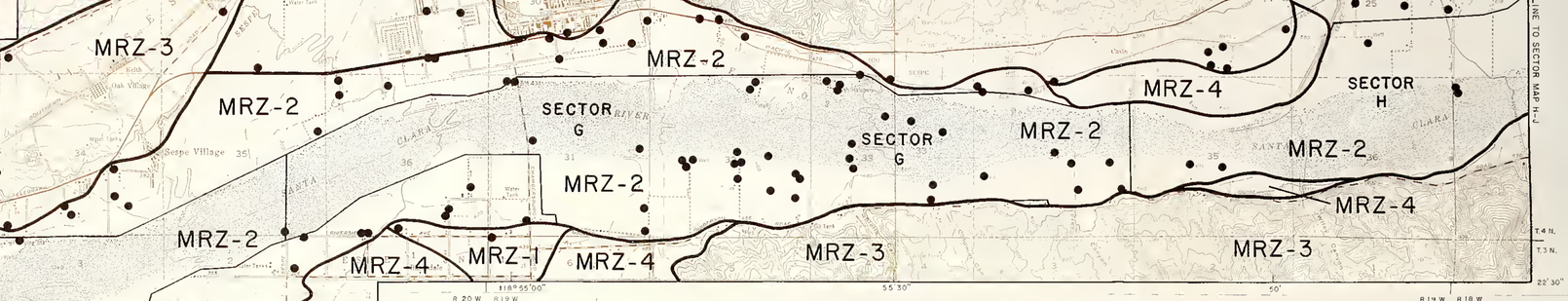


AGGREGATE RESOURCE SECTORS E-H

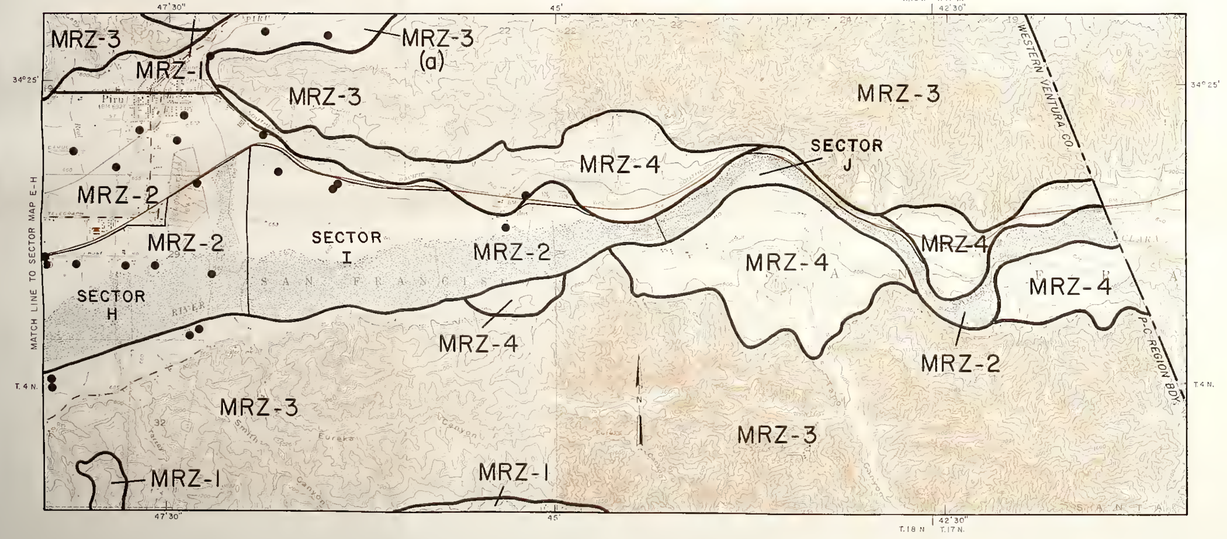


AGGREGATE RESOURCE SECTORS E-H





AGGREGATE RESOURCE SECTORS H-J



Mineral Land Classification of Ventura County

SANTA CLARA RIVER

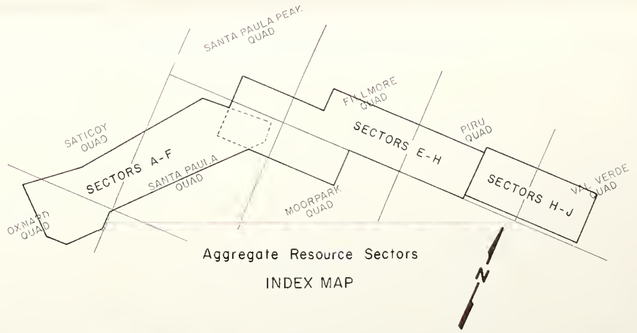
Aggregate Resource Sectors A-J

by

T. P. Anderson
R. C. Loyd
E. W. Kiessling
S. L. Kohler
R. V. Miller

1981

SCALE 1:24,000



Aggregate Resource Sectors
INDEX MAP

EXPLANATION

- Drill Hole
- Areo underloin by extroctable sond and grovel (Resource Sector)
- Riverbed
- MRZ-2 MRZ Line

Topographic bases by U.S. Geological Survey

Drafted by Louise Huckaby.